Alaris® GP Volumetric Pump

Technical Service Manual

CardinalHealth

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Chapter 1

General Information

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Introduction

The Alaris® GP Volumetric Pump and the Alaris® GP Guardrails® Volumetric Pump (hereinafter referred to as 'Pump') is a small lightweight volumetric infusion pump that provides accurate and reliable infusions over a range of rates.

The pump is designed to meet the infusion requirements as specified in the *Directions For Use (DFU)* for all hospital departments including general wards, critical and intensive care, operating rooms and accident and emergency rooms.

This pump is suitable for use by appropriately trained clinicians or nurses. This pump can be used for intravenous infusion modes. Supporting fluid & drug therapy, blood transfusions and parenteral feeding.

Product Familiarity

Ensure that you are fully familiar with the pump by carefully studying the *Directions for Use* (*DFU*) prior to operation and prior to attempting any repairs or servicing. As part of continuous improvement, product enhancements and changes are introduced from time to time.

Purpose of this Manual

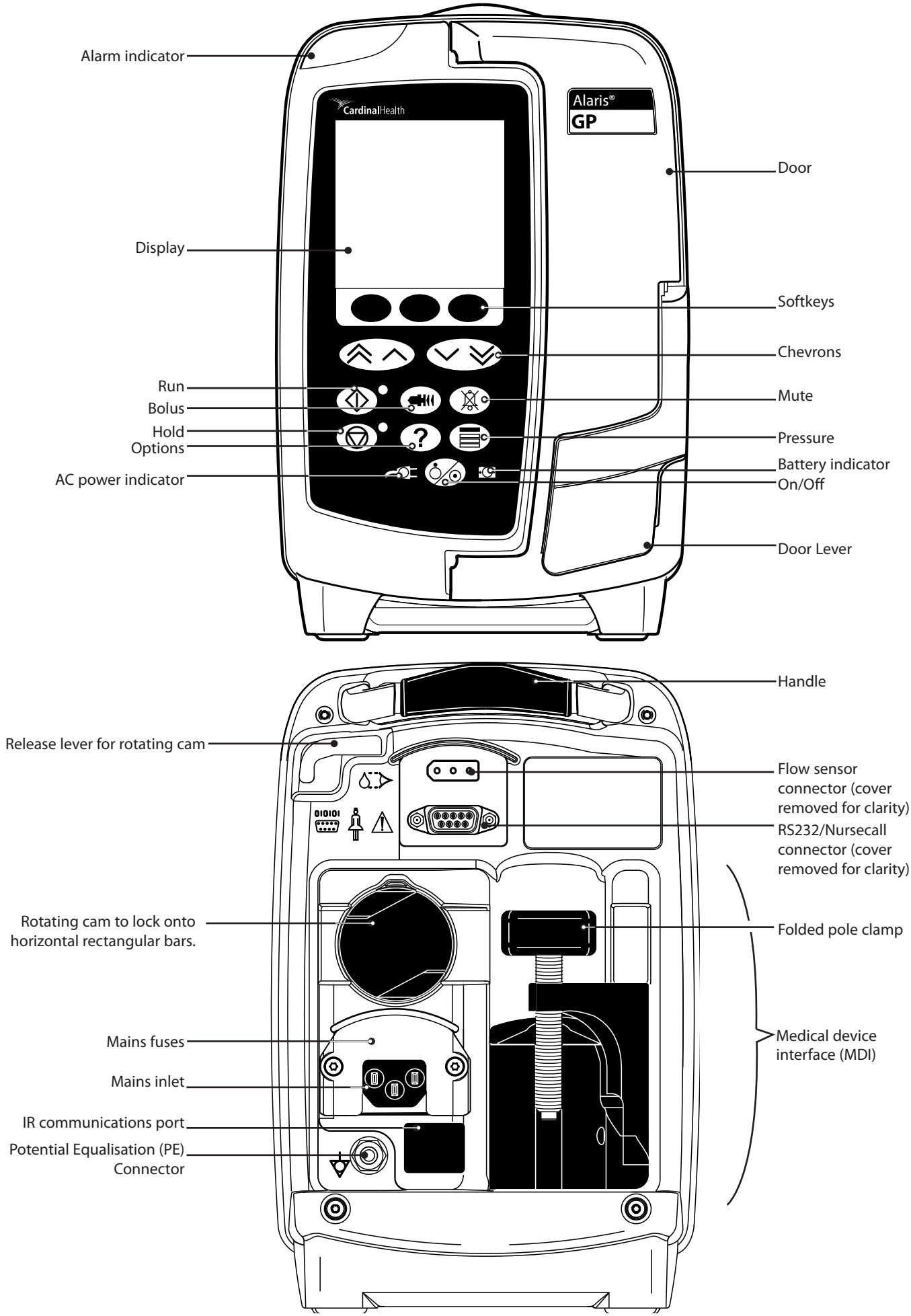
This Technical Service Manual describes how to set up, test and maintain the Alaris® GP Volumetric Pump and the Alaris® GP Guardrails® Volumetric Pump.

This manual is intended for use by personnel experienced in medical equipment testing and maintenance procedures.

Conventions Used in this Manual

BOLD	Used for Display names, self-test codes, controls and indicators referenced in this manual, for example, **Battery Indicator**, access code **212**, **ON/OFF** button.
'Single quotes'	Used to indicate cross-references made to another section of this manual. For example, see Chapter 2, 'Configuration & Calibration'.
underline	Used to indicate a link to another section within this manual.
Italics	Used to refer to other documents or manuals. For example, refer to the relevant *Directions for Use (DFU)* for further information. Also used for emphasis, for example, ...if the gap *still* measures less than...
	Wherever this symbol is shown a Hints & Tips note is found. These notes provide useful advice or information that may help to perform the task more effectively.
	Wherever this symbol is shown a Toolbox note is found. These notes highlight an aspect of test or maintenance that is important to know about. A typical example is drawing attention to a software upgrade that you should check has been installed.

Features of the Pump



General Precautions

Attention consult accompanying documents: Prior to using this pump, carefully read the Operating Precautions described in the *Directions for Use (DFU)*.

This pump contains static-sensitive components. Observe strict precautions for the protection of static sensitive components when attempting to repair and service the pump.

An explosion hazard exists if the pump is used in the presence of flammable anaesthetics. Exercise care to locate the pump away from any such hazardous sources.

Dangerous Voltage. An electrical shock hazard exists if the casing of the pump is opened or removed. Refer all servicing to qualified service personnel.

This pump is protected against the effects of high energy radio frequency emissions and is designed to be fail safe if extremely high levels of interference are encountered. Should false alarm conditions be encountered, either remove the source of the interference or regulate the infusion by another appropriate means.

If the pump is dropped, subjected to excessive moisture, humidity or high temperature, or otherwise suspected to have been damaged, remove it from service for inspection by qualified service personnel.

When connected to an external power source, a three-wire (Live, Neutral, Earth) supply must be used. If the integrity of the external protective conductor in the installation or its arrangement is in doubt, the pump should be operated from the battery.

Chapter 2

Configuration and Calibration

In this Chapter

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Entering Service Mode

Warning -
At no time should Service Mode be entered while the pump is connected to a patient.
Service Mode should only be accessed by qualified and trained personnel.

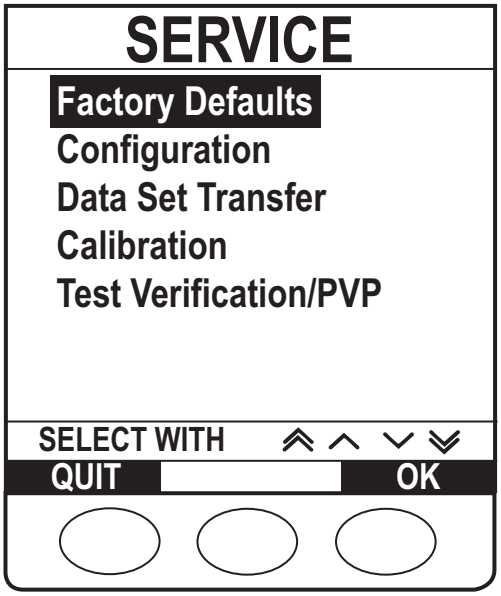
Service Mode can be accessed via a three-digit access code that is entered using the following procedure:

1. Hold down and turn the pump ON .
2. Enter the access code **212** using the keys and the **NEXT** softkey.
3. When the code shows on screen, press **OK** to confirm.

Select the required option using the keys and the **OK** softkey.

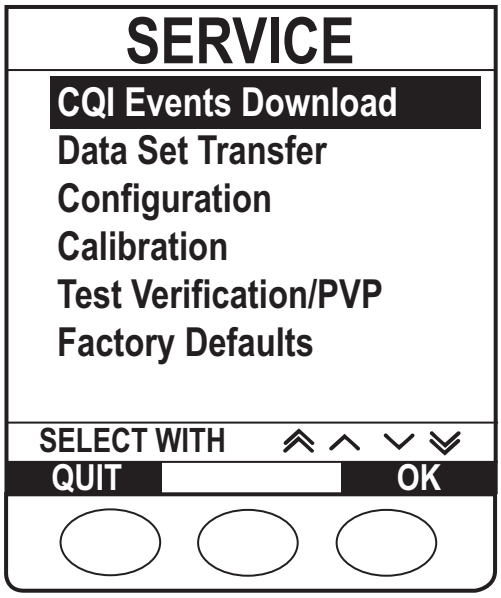
For the Alaris® GP Volumetric Pump the options will be as follows:

Factory Defaults	Load a default data set. Confirm to perform a cold start.
Configuration	This menu comprises a list of options which are configurable by the user.
Data Set Transfer	Upload a data set to pump.
Calibration	This menu comprises a list of calibrations which can be performed by the user.
Test Verification/PVP	Performance Verification Procedure Tests.



For the Alaris® GP Guardrails® Volumetric Pump the options will be as follows:

CQI Events Download	For future implementation
Data Set Transfer	Upload a data set to pump.
Configuration	This menu comprises a list of options which are configurable by the user.
Calibration	This menu comprises a list of calibrations which can be performed by the user.
Test Verification/PVP	Performance Verification Procedure Tests.
Factory Defaults	Load a default data set. Confirm to perform a cold start.



Service Mode - Factory Defaults

Factory Defaults

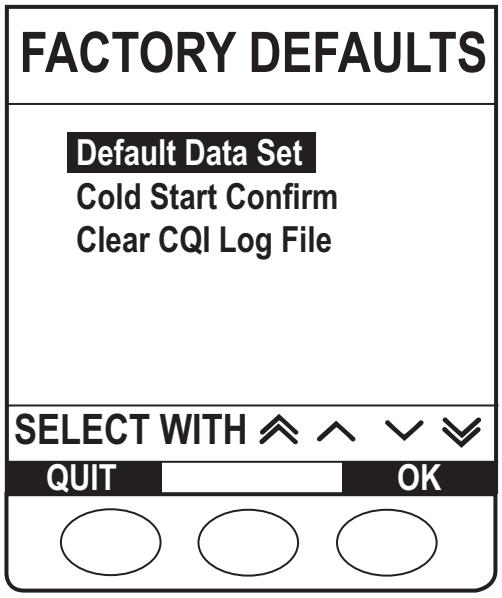
Select the required option using the ⏫⏬ keys and the **OK** softkey.

Default Data Set Replace the current data set with a default data set.

Cold Start Confirm Confirm clearing and resetting the data set and calibration data to the factory defaults.

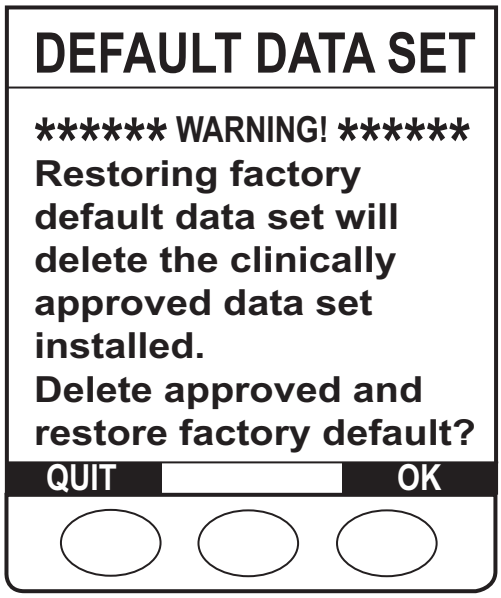
Clear CQI Log File* Confirm clearing all pump history and resetting the data set to the factory default.

* Alaris® GP Guardrails® Volumetric Pump only.



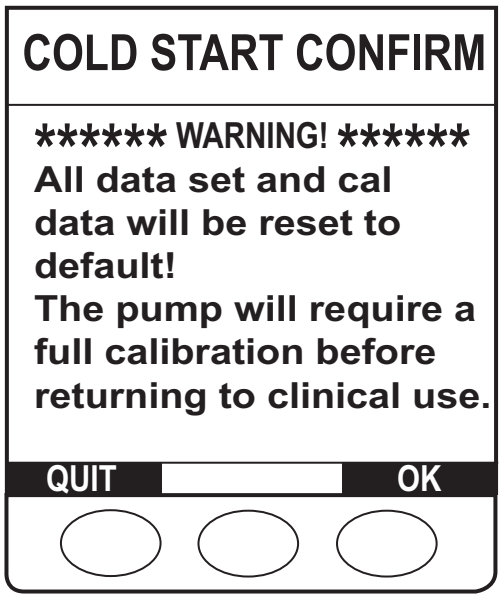
Default Data Set

1. Press **OK** to confirm loading the default data set.



Cold Start Confirm

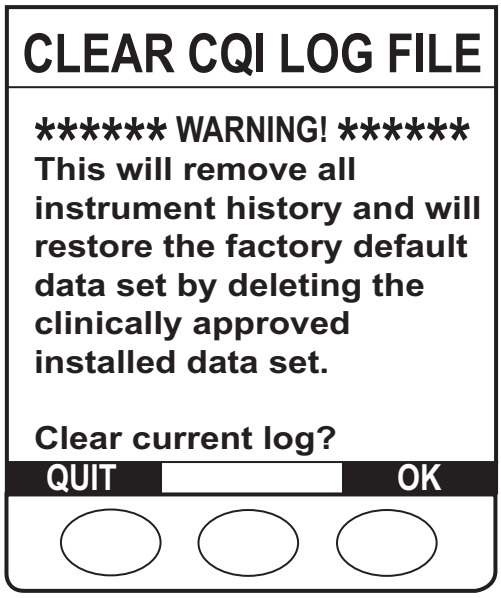
1. Press **OK** to confirm performing a cold start.



Service Mode - Factory Defaults (continued)

Clear CQI Log File

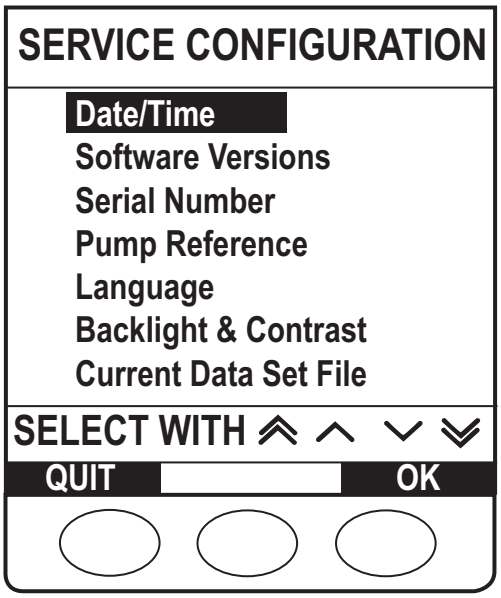
1. Press **OK** to confirm clearing the CQI Log File.



Service Mode - Configuration

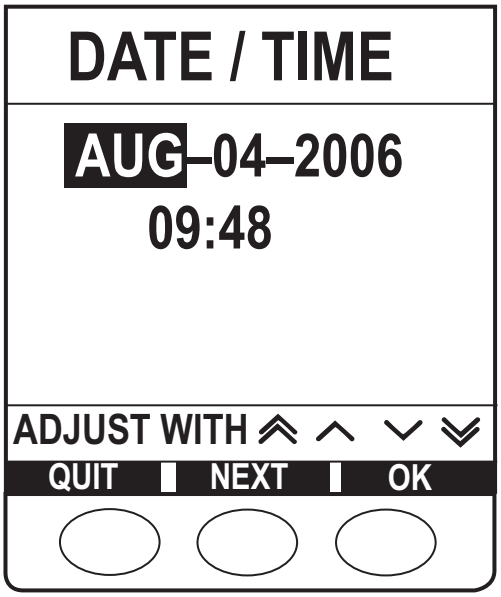
Select the required option using the ⏫🔼🔽⏬ keys and the **OK** softkey.

Date/Time	Sets the current date and time used for event logging.
Software Versions	Displays the pump software versions.
Serial Number	Configure the displayed serial number.
Pump Reference	Pump specific text to be displayed in user mode at start up. (20 characters max.)
Language	Configure the Language used for display messages.
Backlight & Contrast	Adjust the Backlight and Contrast values
Current Data Set File	Displays the current data set file details.



Date/Time

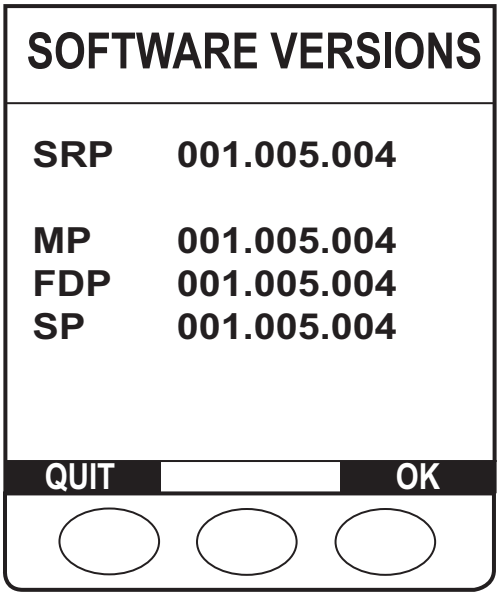
1. Set the correct date and time using the ⏫🔼🔽⏬ keys.
2. Press **NEXT** to continue to next item to change.
3. Press **OK** to confirm.

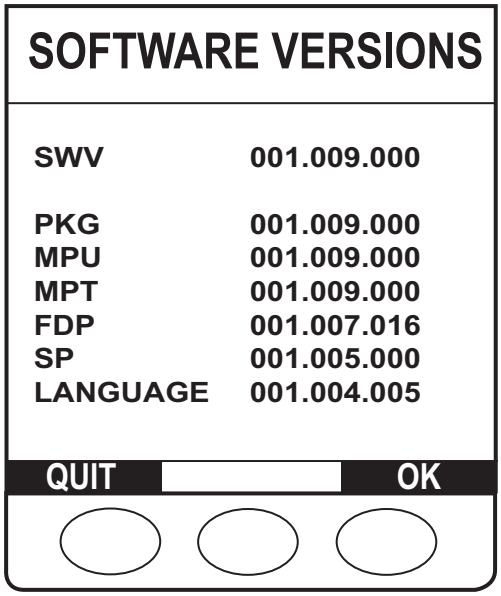


Service Mode - Configuration (continued)

Software Versions

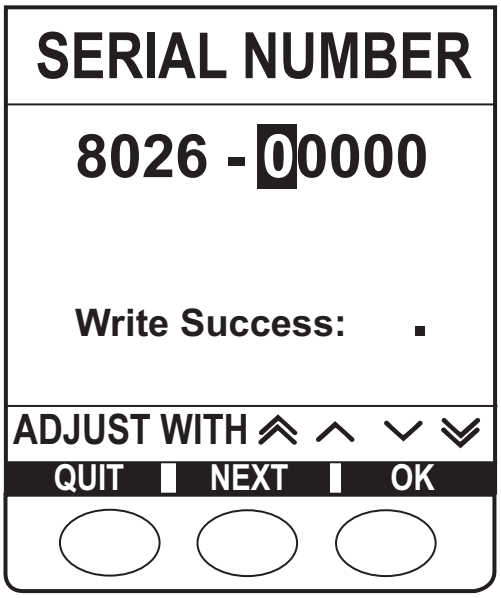
1. Press **OK** to exit after verifying Software Version fitted, display will vary depending on software version fitted.





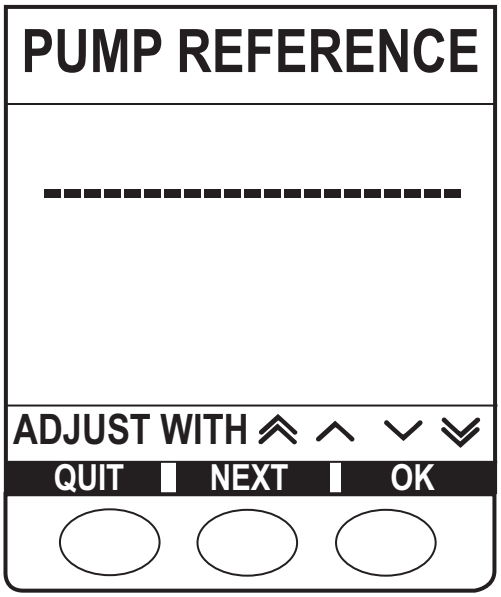
Serial Number

1. Set the serial number required (maximum 9 characters) using the ⏫🔼🔽⏬ keys.
2. Press **NEXT** to continue to next item to change.
3. Press **OK** to confirm.



Pump Reference

1. Set the Pump Reference required using the ⏫🔼🔽⏬ keys.
2. Press **NEXT** to continue to next item to change.
3. Press **OK** to confirm.

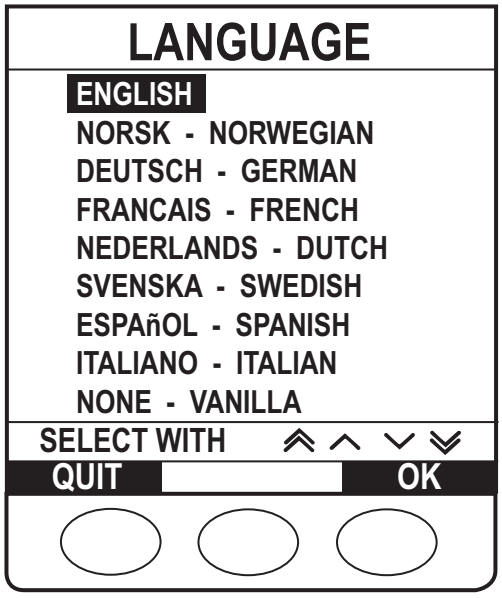


Service Mode - Configuration (continued)

Language

1. Select the required Language using the ⏫🔼🔽⏬ keys.
2. Press **OK** to confirm.

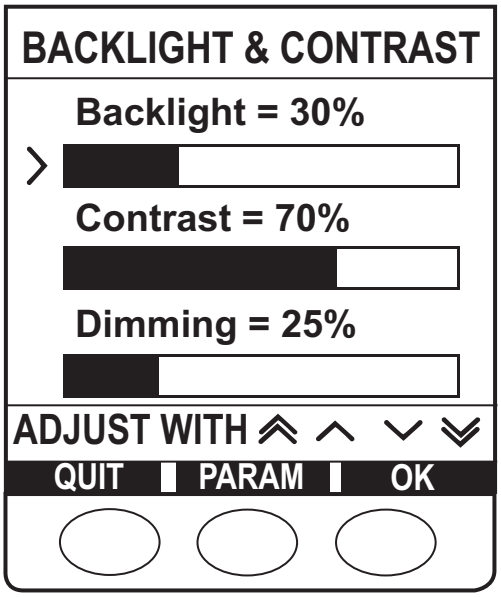
Languages available will be dependant on the pump software version.



Backlight & Contrast

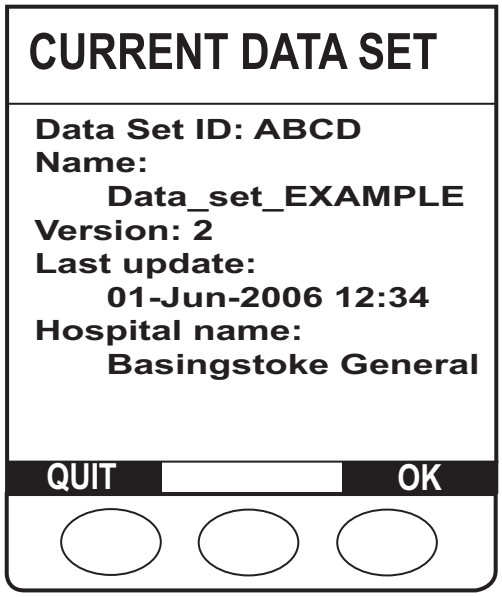
1. Use the ⏫🔼🔽⏬ keys to adjust Backlight and Contrast to required setting.
2. Press **PARAM** to change between Backlight and Contrast.
3. Press **OK** to confirm.

Select the Dimming parameter to see what the display would look like when dimmed.



Current Data Set File

1. Press **OK** to exit after verifying current data set information.



Service Mode - Data Set Transfer

Upload data set to an Alaris® GP Volumetric Pump

Equipment required:

- Alaris® GP Editor Software Kit (1000SP01310) - includes the Alaris® GP Transfer Tool
- RS232 cable (1000SP01183)
- USB to RS232 Converter cable (1000EL00979) - optional
- USB to RS232 converter 4 way hub (1000EL00980) - optional
- PC - for requirements see Upgrading Firmware PC requirements

Using the Alaris® GP Transfer Tool allows a released data set to be uploaded to an Alaris® GP Volumetric Pump.

Warning -
At no time should the Alaris® GP Transfer Tool be used to upload to an Alaris® GP Volumetric Pump while the pump is connected to a patient.

In Service Mode select **Data Set Transfer** using the ⏶⏷ keys and the **OK** softkey.

1. Using the Alaris® GP Transfer Tool select data set to be uploaded.
2. Press the **RS232** or **IrDA** softkey to select the Comms mode being used.
3. Connect the pump to PC.
4. Press the **START** softkey to begin transfer.
5. Please ensure the data set ID shown on the pump is identical to the one transferred.
6. Press **PASS** softkey to confirm correct transfer and exit.
7. To transfer the data set to another pump repeat steps 2 to 6.

Upload data set to an Alaris® GP Guardrails® Volumetric Pump

Equipment required:

- Guardrails® Editor V3.1 Software Kit (1000SP01389) or Guardrails® Editor V3.1 Transfer Tool Software Kit (1000SP01390)
- RS232 cable (1000SP01183)
- USB to RS232 Converter cable (1000EL00979)
- USB to RS232 converter 4 way hub (1000EL00980) - optional
- PC - for requirements see Upgrading Firmware PC requirements

Using the Guardrails® Editor V3.1 Transfer Tool allows an approved data set to be uploaded to an Alaris® GP Guardrails® Volumetric Pump.

Warning -
At no time should the Guradrails® Editor V3.1 Transfer Tool be used to upload to an Alaris® GP Guardrails® Volumetric Pump while the pump is connected to a patient.

In Service Mode select **Data Set Transfer** using the ⏶⏷ keys and the **OK** softkey.

1. Using the Guardrails® Editor V3.1 Transfer Tool Transfer Tool select data set to be uploaded.
2. Connect the pump to PC.
3. Press the **START** softkey to begin transfer.
4. Please ensure the data set ID shown on the pump is identical to the one transferred.
5. Press **ACCEPT** softkey to confirm correct transfer and exit.
6. To transfer the data set to another pump repeat steps 2 to 5.

Caution: Loading the Data Set Transfer Tool software is considered a non-clinical service activity. Interconnecting the pump with a PC may cause the safety or electromagnetic environment to change while the connection exists. The threat of higher leakage currents or EMI disturbances may be present. Disconnect the IrDA or RS232 cable connection at both ends following software upload activities.

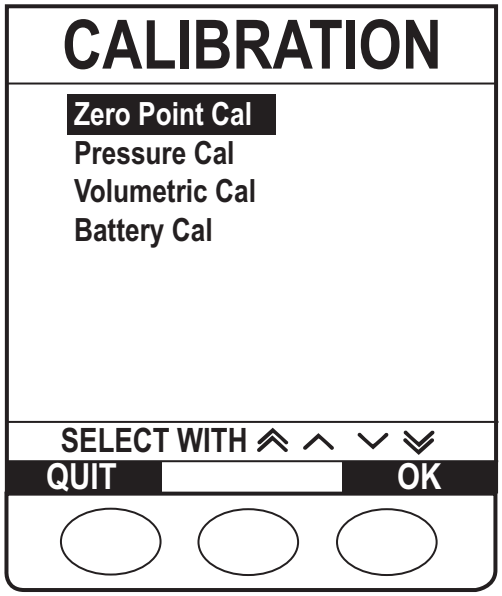
For more information relating to the Alaris® GP Editor Software or the Guardrails® Editor V3.1 Software refer to the relevant Directions For Use supplied with the software.

Service Mode - Calibration

Zero Point Calibration

Select the required option using the ⏫🔼🔽⏬ keys and the **OK** softkey.

1. Wait for the pressure sensors to park.
2. Ensure that an infusion set is not installed.
3. Press the **START** softkey.
4. Pump will countdown for 15 seconds.
5. Press the **ACCEPT** softkey.
6. Press the **PASS** softkey.



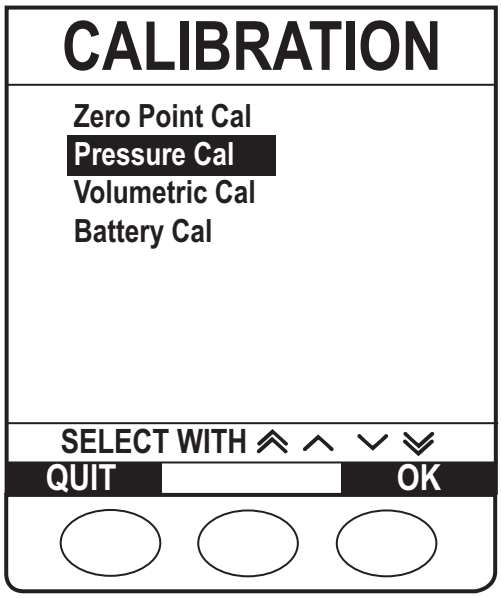
Pressure Calibration

Equipment required:

- Calibrated Pressure Gauge, minimum specification of
  - Accuracy = 0.10% of full scale
  - Full scale = 1500mmHg
- Pressure Calibration Set (1000SP01422) Use to calibrate 10 pumps and then change

Set up equipment as per figure 2-1 and allow 30 seconds before proceeding.

Select the required option using the ⏫🔼🔽⏬ keys and the **OK** softkey.



Service Mode - Calibration (continued)

Pressure Calibration continued

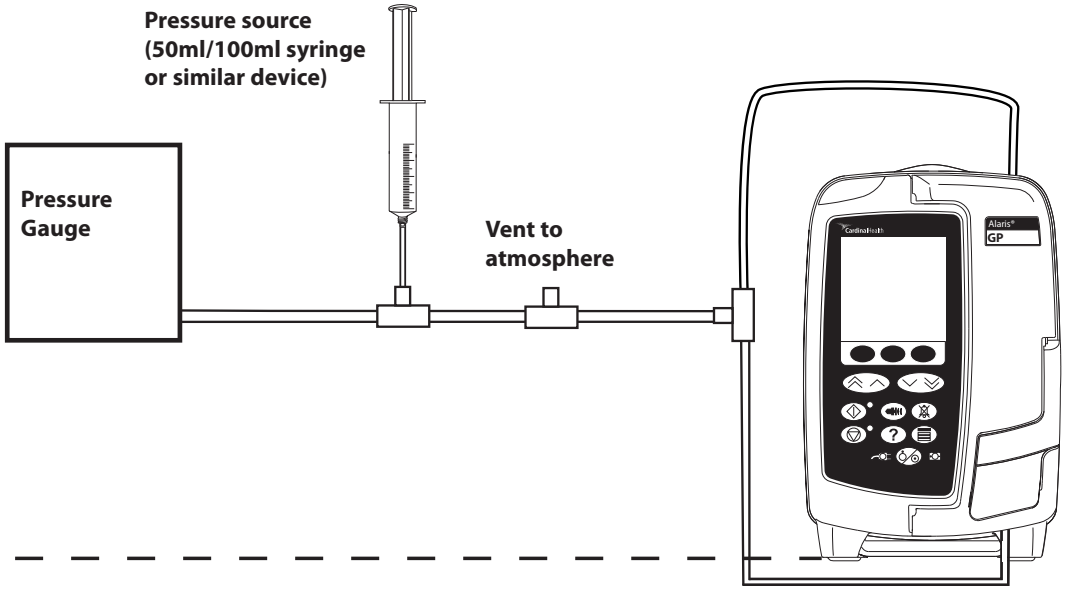


Figure 2 - 1 Pressure Calibration Equipment Set Up

1. Turn 3-way tap to close from atmosphere.
2. Press the **START** softkey.
3. Apply a pressure of 200mmHg and pump will countdown for 15 seconds.
4. Press the **ACCEPT** softkey.
5. Apply a pressure of 800mmHg and pump will countdown for 15 seconds.
6. Press the **ACCEPT** softkey.
7. Turn 3-way tap to vent to atmosphere.
8. Turn 3-way tap to close from atmosphere.
9. Press the **NEXT** softkey to proceed to Verification Procedure.

Verification Procedure

Software version v1.7.x and below

10. Apply a pressure of 200mmHg and wait for 5 seconds.
11. Press the **NEXT** softkey.
12. Apply a pressure of 400mmHg and wait for 5 seconds.
13. Press the **NEXT** softkey.
14. Apply a pressure of 600mmHg and wait for 5 seconds.
15. Press the **NEXT** softkey.
16. Apply a pressure of 800mmHg and wait for 5 seconds.
17. Press the **NEXT** softkey.
18. Turn 3-way tap to vent to atmosphere.
19. Press the **PASS** softkey.

Software version v1.9.0 and above

10. Apply a pressure of 500mmHg and wait for 5 seconds.
11. Press the **NEXT** softkey.
12. Turn 3-way tap to vent to atmosphere.
13. Press the **PASS** softkey.

Service Mode - Calibration (continued)

Volumetric Calibration

Select the required option using the ⏫🔼🔽⏬ keys and the **OK** softkey.

1. Load the primed Infusion Set (60793) into the Pump and set-up as shown in Figure 2-2 below and adjust the fluid level so that the meniscus is level with the zero mark.
2. Press **START** to begin. Test will run and fluid will be delivered into the burette.
3. When **Volume delivered!** is displayed, check accumulated air in line value is less than 100µl then enter the volume delivered into the burette using the ⏫🔼🔽⏬ keys and the **OK** softkey. If accumulated air in line value is greater than 100µl then repeat test.

If measured value is 19.3ml or less then enter 19.2ml and if value is 20.6ml or higher then enter 20.7ml.

4. If no calibration is required (Volume delivered within limits of 19.4ml to 20.5ml) then press **PASS** to confirm and exit.
5. If the Calibration value is changed automatically then press **VERIFY** and repeat steps 2 to 4.
6. If the pump still fails replace the Platen and Fingers then repeat the calibration procedure.

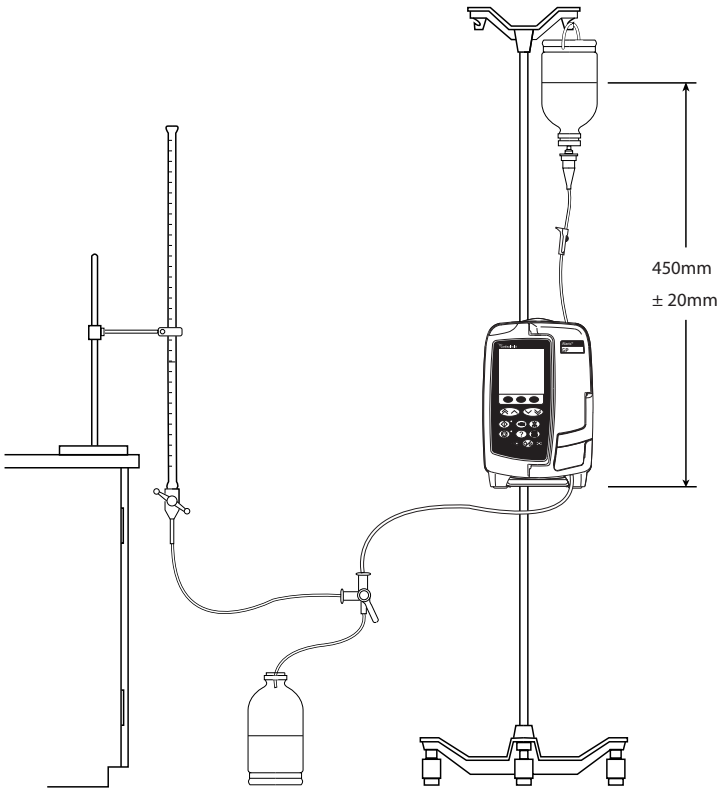
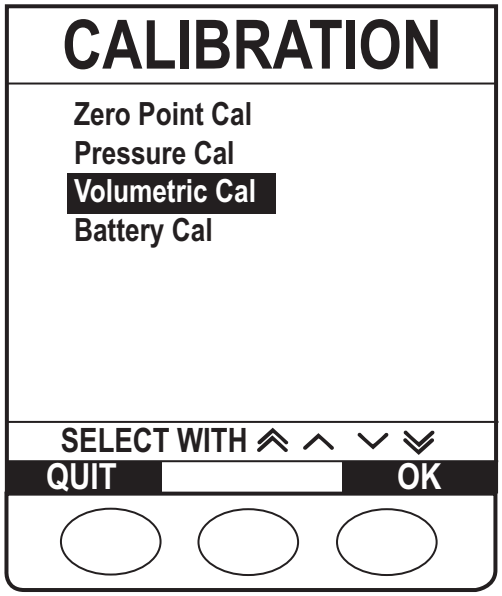
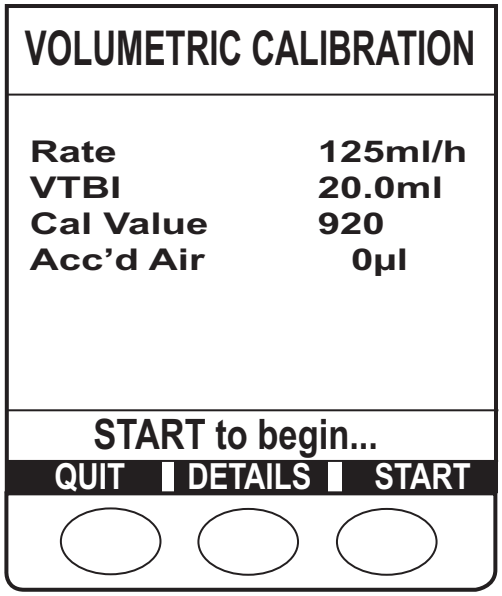


Figure 2 - 2 Volumetric Calibration Equipment Set Up



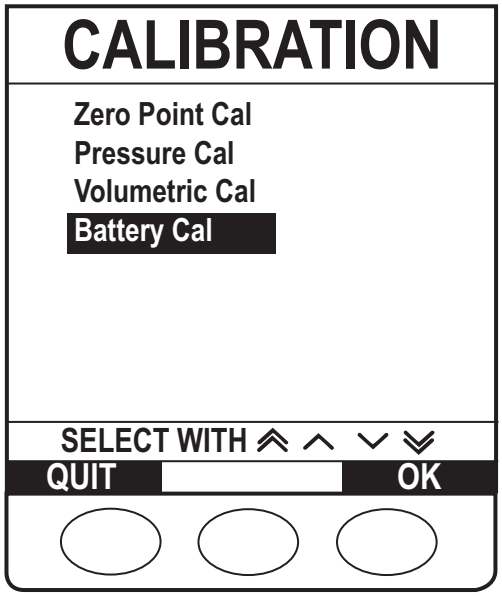


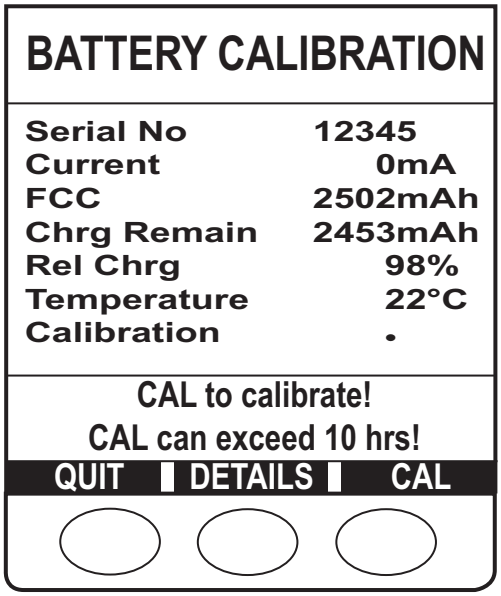
Service Mode - Calibration (continued)

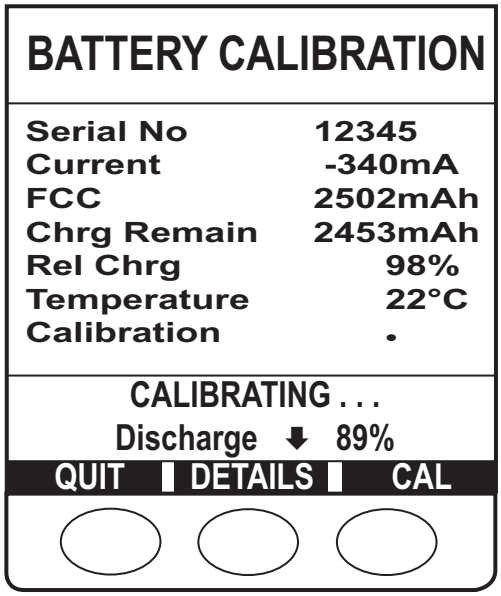
Battery Calibration

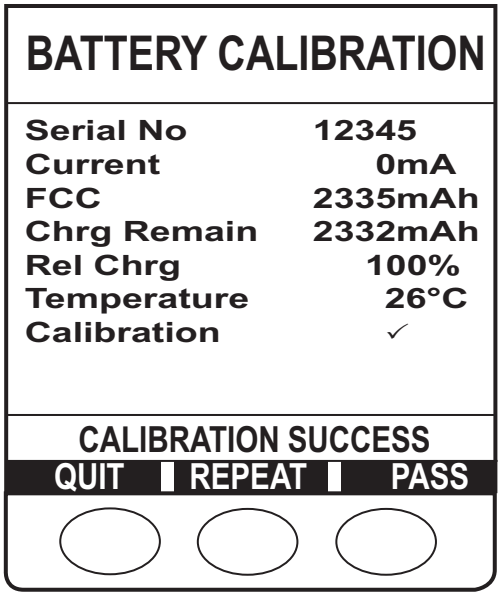
Select the required option using the ⏫🔼🔽⏬ keys and the **OK** softkey.

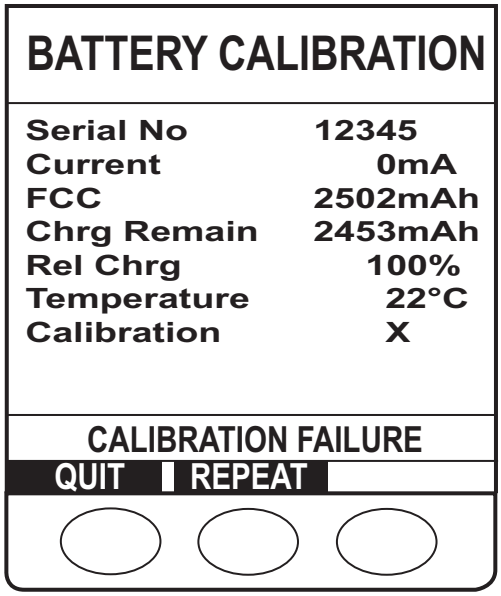
1. Connect AC Mains to the Pump and press **CAL** to begin.
2. When calibration is complete it will display **CALIBRATION SUCCESS** or **CALIBRATION FAILURE**. Press **PASS** to confirm successful calibration or **REPEAT** to perform calibration again.











Chapter 3

Preventative Maintenance

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Preventative Maintenance

To ensure the pump remains in good operating condition, routine and preventative maintenance inspections are required. Routine maintenance inspections should be performed by hospital/facility before each use, see *Directions For Use* for details.

Preventative maintenance inspections should be performed at least every year.

For the preventative maintenance inspection the following should be performed:

- Full visual inspection of the pump, internal and external
- Fitting of all updates required
- Battery test and/or replacement
- Clean the pump
- Performance Verification Procedures

Following all spare part replacement and repair activities, testing must be performed in accordance with the Performance Verification Procedure (PVP). Additional testing and calibration may be required after certain repairs are completed, see table in Chapter 6 'Corrective Maintenance' for more information.

Visual Inspection

Open the pump, as per Chapter 6 'Corrective Maintenance' and visually inspect the interior of the pump.

Visually inspect the exterior of the pump checking the following:

- Labels should be replaced as required if not flat, legible or fully adhered.
- Check Keypad for any sign of wear and replace as required.
- Case components must be checked for damage and replaced if necessary.
- Check the pole clamp is not damaged and that it functions correctly.
- Inspect the AC power supply plug and cable for damage.
- The case should be clean and free from IV solution residue, especially near moving parts.
- Check for dried solution deposits on accessible areas of pumping mechanism.

Recommended Cleaning and Storage

Cleaning the Pump: -
Before the transfer of the Pump to a new patient and periodically during the use, clean the Pump by wiping over with a lint-free cloth lightly dampened with warm water and a standard disinfectant / detergent solution.

Recommended cleaners are:

Brand	**Concentration**
Hibiscrub	20% (v/v)
Virkon	1% (w/v)

Do not use the following disinfectant types:

- NaDcc (such as PRESEPT)
- Hypochlorites (such as CHLORASOL)
- Aldehydes (such as CIDEX)
- Cationic Surfactants (such as Benzalkonium Chloride)
- Iodine (such as Betadine)
- Concentrated Isopropyl alcohol based cleaners will degrade plastic parts.

Before cleaning always switch OFF and disconnect from the AC power supply.
Never allow fluid to enter the casing and avoid excess fluid build up on the Pump.
Do not use aggressive cleaning agents as these may damage the exterior surface of the Pump.
Do not steam autoclave, ethylene oxide sterilise or immerse this Pump in any fluid.

Storing the Pump: -
If the Pump is to be stored for an extended period it should be first cleaned and the internal battery fully charged. Store in a clean, dry atmosphere at room temperature and, if available, employ the original packaging for protection.
Once every 3 months during storage, carry out functional tests as described in this technical service manual and ensure that the internal battery is fully charged.

Cleaning and storing the Infusion Set: -
The Infusion Set is a disposable single use item and should be discarded after use according to hospital protocol.

Recommended Cleaning and Storage (continued)

Cleaning the door: -
Periodically during use (as per hospital policy), clean the door by wiping over with a lint-free cloth, lightly dampened with warm water and a standard disinfectant / detergent solution. Dry door before use.
To aid cleaning of a door which has been heavily soiled, contaminated or if the door operation is not free moving, then the door may be removed (see procedure below) then immersed and soaked in warm water with a standard disinfectant / detergent.
The door should be allowed to dry fully prior to use.

Door Removal

1. Remove the screw securing the lower hinge lock.

2. Open the lower hinge lock.

3. Pull the door away from lower hinge pin and lift up to remove the door.

4. Clean the door.

5. Refit door in reverse order. Ensure screw is refitted with a torque of 70cNm.

Cleaning the Flow Sensor: -
Before the transfer of the flow sensor to a new infusion set and periodically during use, clean the flow sensor by wiping over with a lint-free cloth lightly dampened with warm water and a standard disinfectant / detergent solution. Ensure the connector does not get wet. Dry flow sensor before use.
To aid cleaning of flow sensors which have been heavily soiled, contaminated or if the handle operation is not free moving, then the flow sensor may be immersed and soaked in clean soapy water (see note below). The inside of the spring mechanism can be cleaned by activating it whilst submerged in the water.
After cleaning, the sensor should be allowed to dry fully prior to use.

Warning -
The plug of the flow sensor must not be immersed in water as damage will occur.

Updates

Upgrading firmware

Requirements

- PC
- Minimum hardware system requirements:
  - 1GHz Pentium processor
  - 1GB of free space on the system hard drive
  - Available configurable RS232 9 pin serial or USB communications ports
  - Video resolution of 1024 X 768 pixels and 16 bit colour depth
  - 512MB RAM
  - CD ROM drive
  - Keyboard
  - Mouse

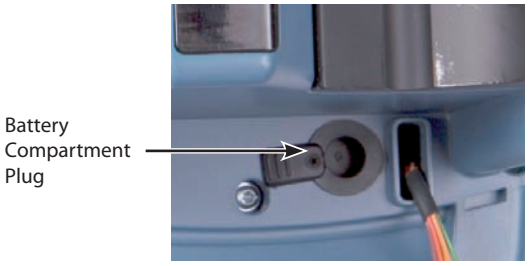
Software requirements:

- Microsoft Windows 2000 (service pack 4), or XP (service pack 2)

- The Software Maintenance Utility (SMU) (1000CD00028)
- RS232 cable (1000SP01183)
- USB to RS232 Converter cable (1000EL00979) - optional
- USB to RS232 converter 4 way hub (1000EL00980) - optional
- Firmware CD

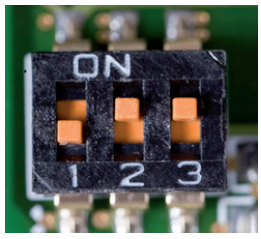
Preparation

- Load the SMU software onto the PC
- Connect RS232 connector (using USB to RS232 converter if required) to each pump being updated
- Disconnect the Battery
- Remove the Battery Compartment Plug



Software Upload

1. Through the Rear Case, there is a set of three dip switches on the bottom of the Control PCB. Switch 1 should be ON and switches 2 and 3 should be OFF.
2. Using a small flat blade screwdriver or round ended tweezers configure the dip switch settings to:
   a. Switch 1 = OFF
   b. Switch 2 = ON
   c. Switch 3 = ON
3. Start the SMU facility to upload the software.
4. Select the Firmware zip file.
5. Select the Comm settings - Comm Port and Baud rate of 460800 (USB to RS232 converter) or 115200 (RS232).
6. Connect the Battery to the Battery Cable.
7. Press **Start**.

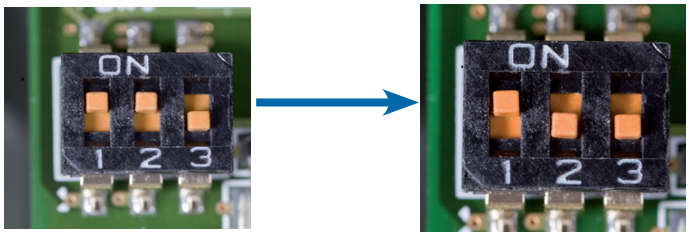


Switch 1 turns the safety battery circuit on but is not required for programming.
Switch 2 forces the pump to turn on.
Switch 3 turns the pump into 'Boot Mode', this is only used for programming.

Updates (continued)

Upgrading firmware continued

8. Once the green bar has reached the far right hand side and the time has reached 0:00 and the flashing green light is a steady green light, the RS232 connector can be removed from the pump.
9. Disconnect the Battery and turn OFF all dip switches.
10. Wait 5 seconds then reconnect the Battery.
11. Configure the Dip Switches to:
    a. Switch 1 = ON
    b. Switch 2 = ON then OFF
    c. Switch 3 = OFF



12. Refit the Battery Compartment Plug, this prevents fluid ingress.
13. Power up the pump in Service Mode, enter access code **212,** then select **Configuration** > **Date/Time** and set the current date and time.

If the Control, Interface or RS232 PCB is replaced, the pump must be re-programmed.

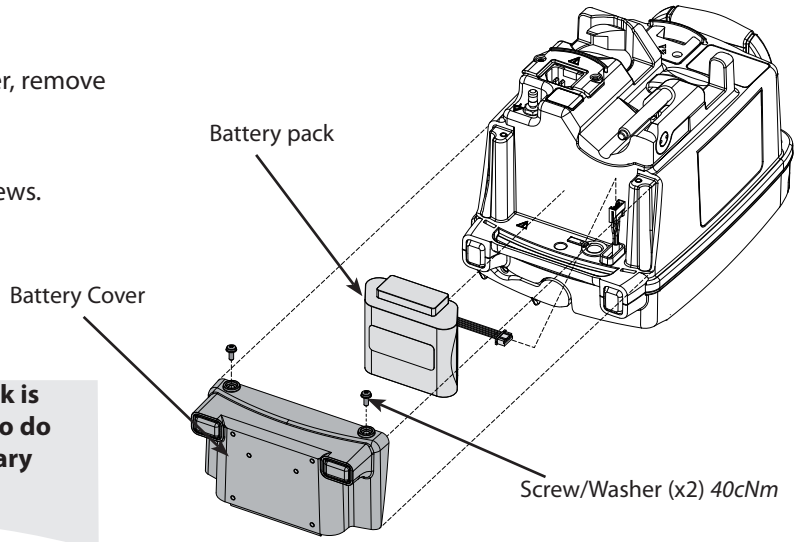
Battery Test and Replacement

To test the battery perform the battery calibration, as outlined in the procedure in Chapter 2 'Configuration and Calibration', and verify that all pass criteria are met. If pass criteria are not met then replace the battery.

Battery charge retention will eventually degrade. So where retention is critical the internal battery should be replaced every three years.

Replace the Main Battery

1. Remove the two case screws in battery cover, remove cover and battery.
2. Fit new battery.
3. Replace battery cover and secure with 2 screws.



It is essential that the battery pack is calibrated after fitting as failure to do so will degrade the quoted auxiliary battery power on this product.

Service Mode - Test Verification/PVP

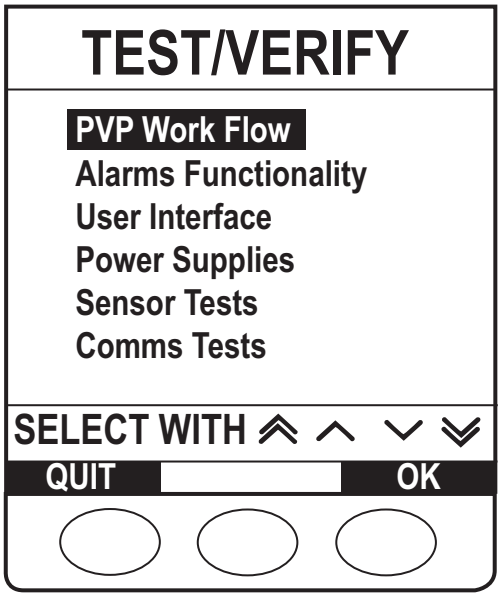
Warning -
At no time should Service Mode be entered while the pump is connected to a patient. Service Mode should only be accessed by qualified and trained personnel.

Enter access code **212** to view the Service Mode menu (see 'Entering Service Mode' in Chapter 2 for instructions).

Select the **Test Verification/PVP** option using the ⏫🔼🔽⏬ keys and the **OK** softkey. Press the **Quit** softkey to return the pump to the access code screen.

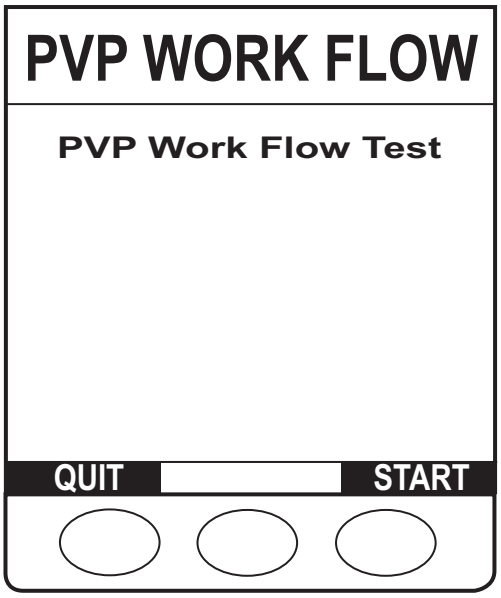
Select the required option using the ⏫🔼🔽⏬ keys and the **OK** softkey.

PVP Work Flow	Performance Verification Procedure (PVP) tests.
Alarms Functionality	Test the Alarms function correctly.
User Interface	Display, Keypad, LEDs and Audio Tests.
Power Supplies	Test AC Mains and Battery operation.
Sensor Tests	Perform tests on the pump sensors.
Comms Tests	RS232, IrDA and Nurse Call Tests.



Service Mode - Test Verification/PVP (continued)

PVP Work Flow



This test is used to confirm that the Pump is functioning correctly.

Press the **START** softkey to begin.

The PVP Work Flow will iterate through the following tests:

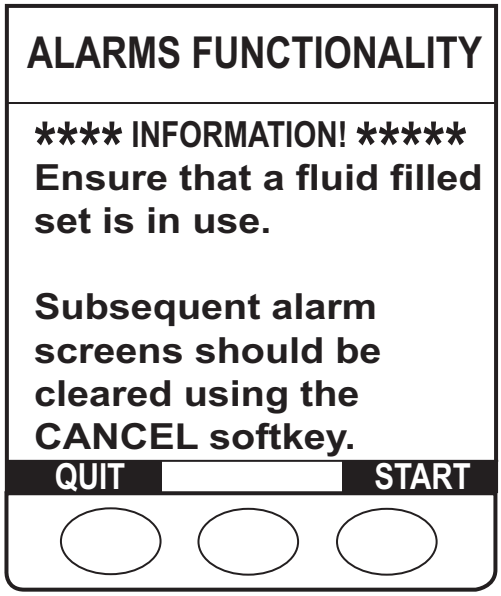
- Software Versions
- Date/Time (read only)
- Serial Number (read only)
- Door Frame
- Safety Clamp
- Sear
- Audio Test
- Chequerboard
- LED's
- Keypad
- Nurse Call
- RS232 Loop Back
- Pumping Efficiency Test
- Downstream Occlusion Pressure Test
- Alarms Functionality
- Volumetric (Accuracy Test) Calibration

See individual test details in this chapter or in Chapter 2 'Configuration and Calibration' for instructions.

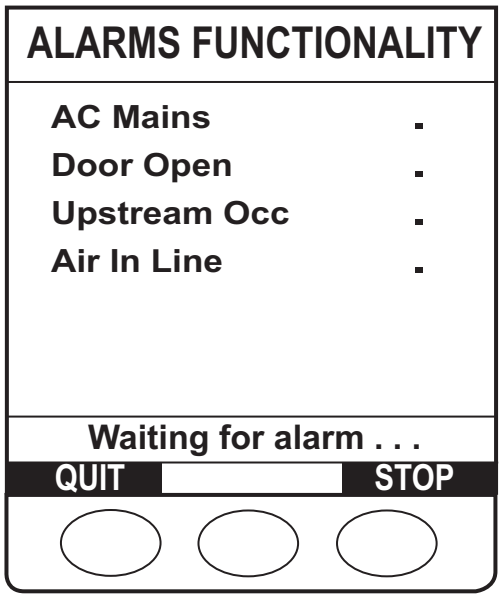
Service Mode - Test Verification/PVP (continued)

Alarms Functionality

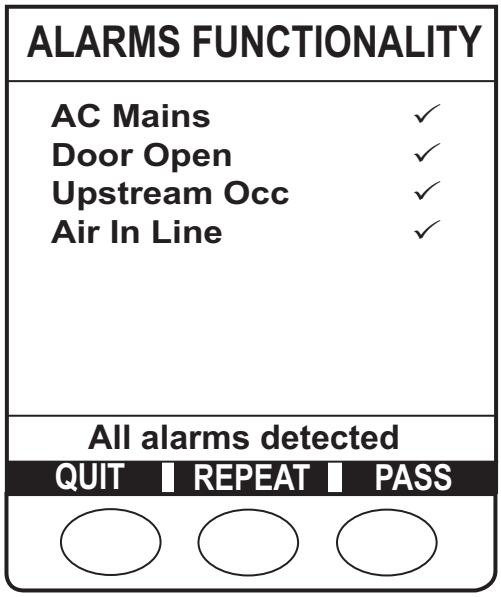
1. Press the **START** softkey to begin.



2. Pump starts an infusion.
3. Check all alarms sound and display correctly.
4. Alarms to test are:
   - AC Mains Disconnect
   - Door Open
   - Upstream occlusion
   - Air In Line

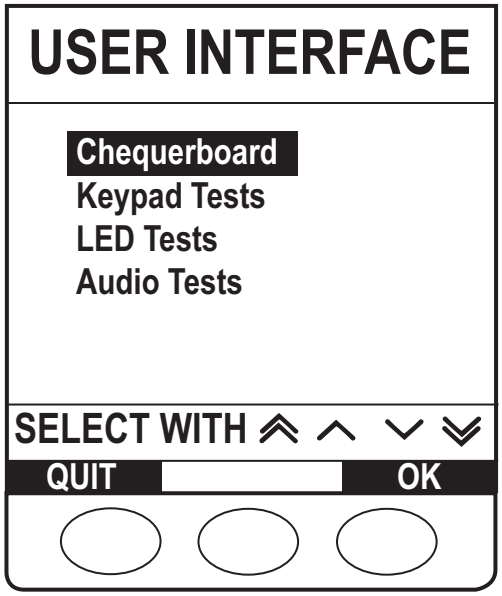


5. When all the alarms have been tested press the **PASS** softkey if all the alarms worked correctly or **REPEAT** softkey if alarms still need to be checked.



Service Mode - Test Verification/PVP (continued)

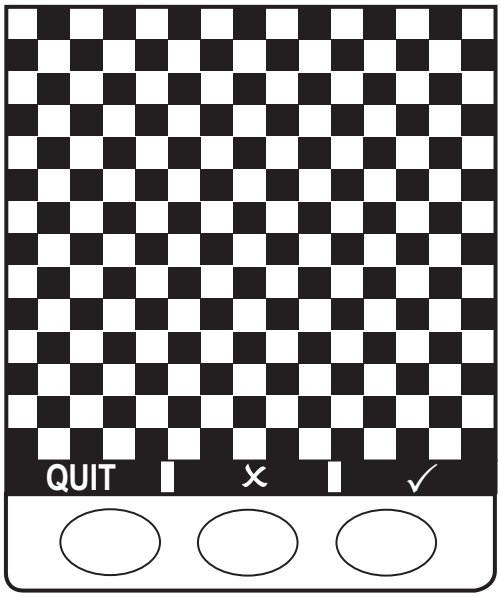
User Interface



Select the required option using the keys and the **OK** softkey.

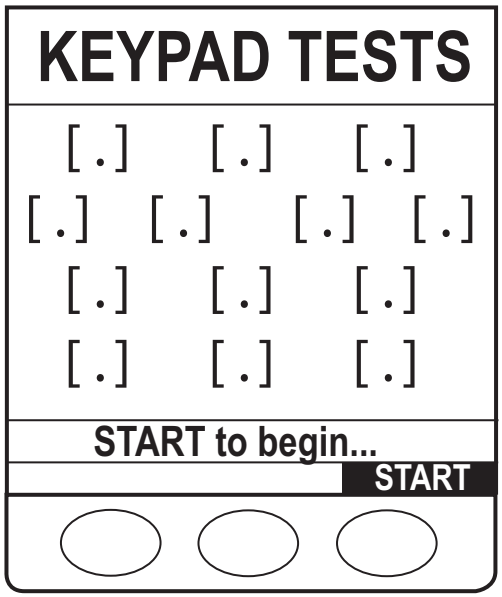
Chequerboard	Display Chequerboard Test.
Keypad Tests	Perform Keypad Test to check all keys work when pressed.
LED Tests	Check all LEDs display in correct order.
Audio Tests	Check Primary and Secondary Audio sounders.

Chequerboard Pattern



1. Check pattern is displayed correctly and ✓ to pass. If pattern is incorrect then press ✕ to fail.
2. Press **PASS** softkey to confirm pass and exit.

Keypad Tests

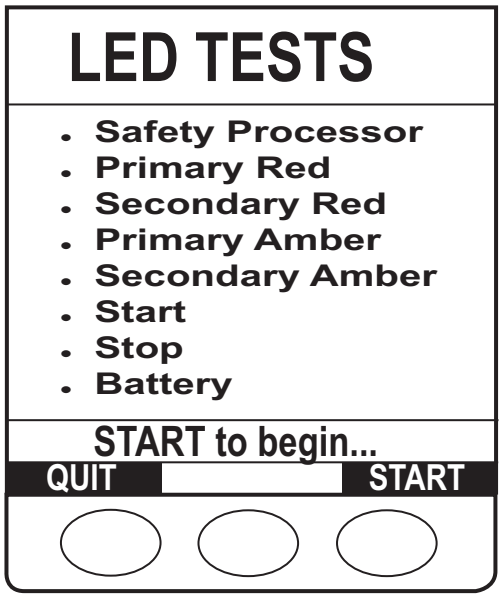


1. Press the **START** softkey to begin.
2. Press all the keys and a ✓ will indicate each key to pass.
3. Press **PASS** softkey to confirm pass and exit.

Service Mode - Test Verification/PVP (continued)

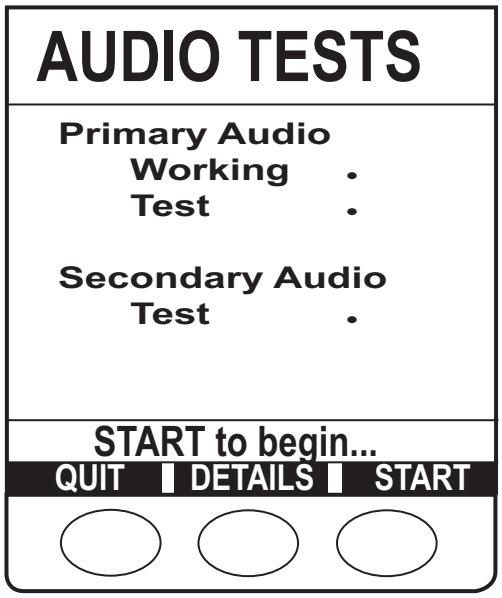
LED Tests

1. Press the **START** softkey to begin.
2. Check LEDs are displayed correctly and ✓ to pass. If an LED is not displayed then press ✕ to fail.
3. Press **PASS** softkey to confirm pass and exit.



Audio Tests

1. Press the **START** softkey to begin.
2. Check Audio sounds are correct and ✓ to pass. If Audio sounds are not correct then press ✕ to fail.
3. Press **PASS** softkey to confirm pass and exit.

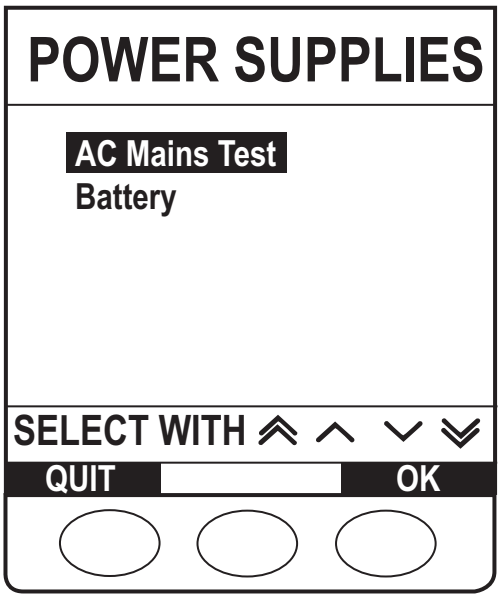


Service Mode - Test Verification/PVP (continued)

Power Supplies

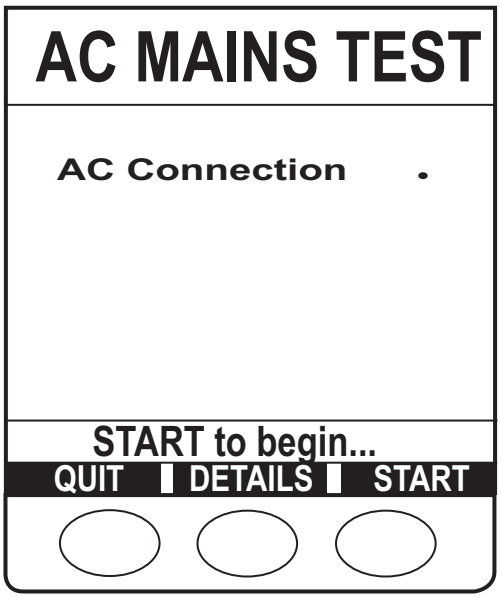
Select the required option using the ⩓⩔ keys and the **OK** softkey.

AC Mains Test	Tests the AC mains removal detection.
Battery	Test the battery. To perform calibration see Chapter 2 'Configuration & Calibration'.



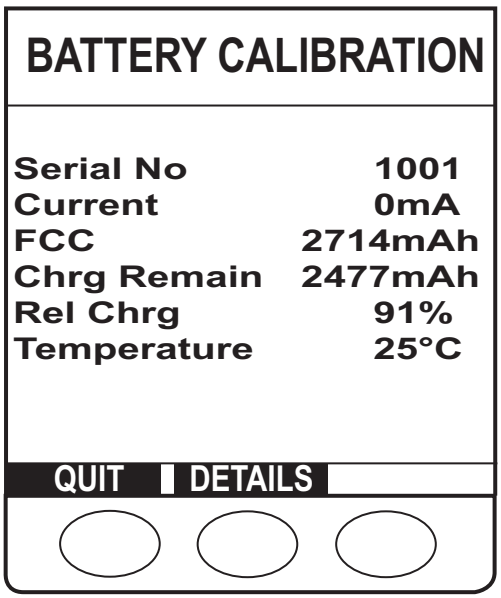
AC Mains Test

1. Press the **START** softkey to begin.
2. Check AC Mains connected/disconnected is correctly indicated and press ✓ softkey or press ✕ softkey if not correctly detected.
3. Press **PASS** softkey to confirm pass and exit.



Battery

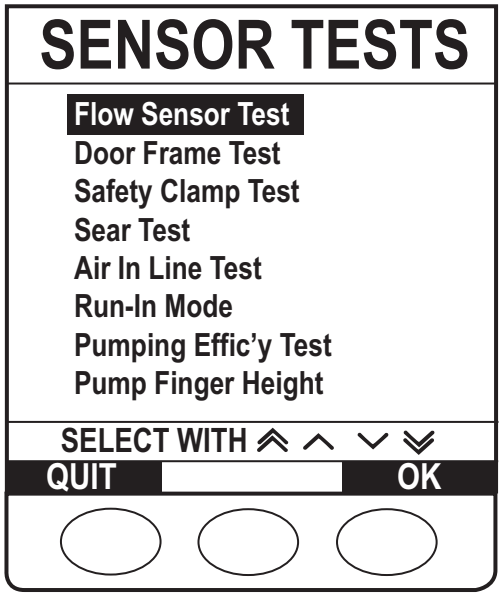
1. Review the battery information.
2. Press the **DETAILS** softkey to see further battery details.
3. Press **QUIT** softkey to exit.



Service Mode - Test Verification/PVP (continued)

Sensor Tests

In Sensor Tests menu select **required test** using the ⏫🔼🔽⏬ keys and the **OK** softkey.

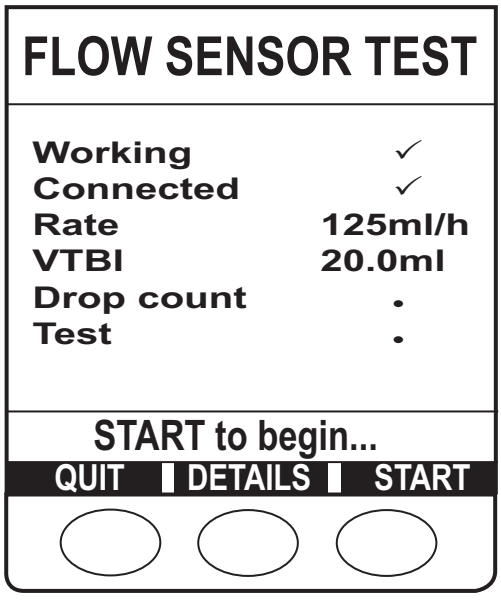


Flow Sensor Test	Check Flow Sensor is connected and drops count.
Door Frame Test	Check door registers as open and closed.
Safety Clamp Test	Check Safety clamp detection registers clamp enabled or disabled.
Sear Test	Check Sear detection registers sear enabled or disabled.
Air In Line Test	Check Air In Line sensor detects fluid and air correctly.
Run-In Mode	Performs a continuous infusion for burn in testing.
Pumping Efficiency Test	This test is used to confirm that the Pump is able to generate sufficient pressure.
Pump Finger Height or Parking Test*	Allows the mechanism to be parked.

* Test name has changed to **Parking Test** for latest software versions however the procedure is the same.

Flow Sensor Test

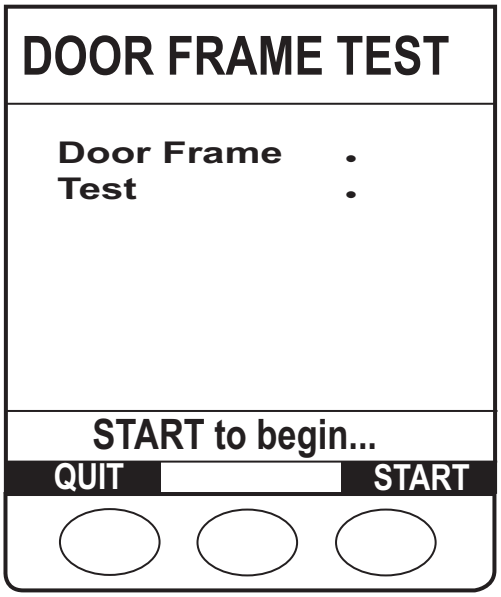
1. Plug flow sensor into connector on rear of the pump.
2. Press the **START** softkey to begin.
3. Check Flow sensor operation is correct and press ✓ softkey if drops are displayed correctly or press ✕ softkey if drops are not detected.
4. Press **PASS** softkey to confirm pass and exit.



Service Mode - Test Verification/PVP (continued)

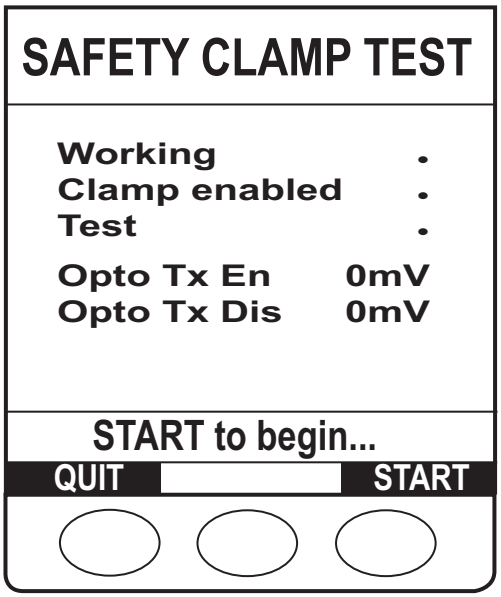
Door Frame Test

1. Press the **START** softkey to begin.
2. Check Door open/closed is correctly indicated and press ✓ softkey or press ✕ softkey if not correctly detected.
3. Press **PASS** softkey to confirm pass and exit.



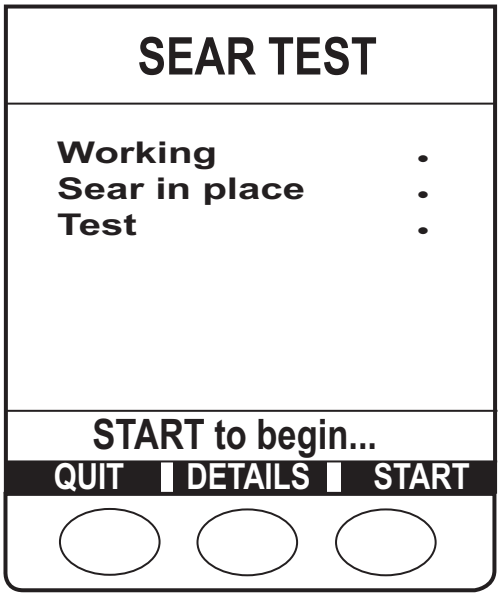
Safety Clamp Test

1. Press the **START** softkey to begin.
2. Check Clamp enabled/disabled is correctly indicated and press ✓ softkey or press ✕ softkey if not correctly detected.
3. Press **PASS** softkey to confirm pass and exit.



Sear Test

1. Press the **START** softkey to begin.
2. Check Sear in/out is correctly indicated and press ✓ softkey or press ✕ softkey if not correctly detected.
3. Press **PASS** softkey to confirm pass and exit.



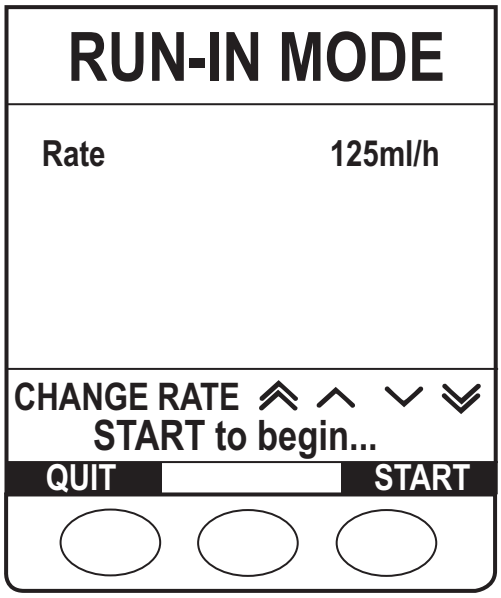
Service Mode - Test Verification/PVP (continued)

Air In Line Test

1. Press the **START** softkey to begin.
2. Insert a fluid filled Infusion Set and an air filled Infusion Set.
3. Confirm pump detects fluid and air correctly and press ✓ softkey or press ✕ softkey if not correctly detected.
4. Press **PASS** softkey to confirm pass and exit.

Run-In Mode

1. Load an Infusion Set.
2. Set the rate required using the ⏫🔼🔽⏬ keys and press the **START** softkey to begin test.
3. Press **STOP** softkey when test is completed.
4. Press **PASS** softkey to confirm pass and exit.



Service Mode - Test Verification/PVP (continued)

Pumping Efficiency Test

This test is used to confirm that the Pump is able to generate sufficient pressure. This is done by infusing into a calibrated pressure gauge and checking that the correct line pressure is achieved. The test set-up is as per figure 3 - 1.

1. Insert the Infusion Set (60793) and the in-line roller clamp closed to prevent fluid flow.
2. Close the door and open the roller clamp on the set. Ensure that the 3-way tap to the transducer is closed to the atmosphere.
3. From the Pressure System Test menu screen, highlight **Pumping Effic'y Test** and press **OK** softkey.
4. Press the **RATE** softkey to select a rate of 50ml/h.
5. Press the **START** softkey and start the timer.
6. When 1000mmHg is reached stop the timer and then press the **STOP** softkey and open the 3-way tap to atmosphere.
7. Record that the time taken to reach 1000mmHg was 2 minutes or less.
8. Press the **PASS** softkey to confirm pass and exit.

Note: If a DRV2 fault code is encountered during the pumping efficiency test and the pressure has exceeded 1000mmHg, the fault should be ignored, and the pump power should be cycled to reset the condition.

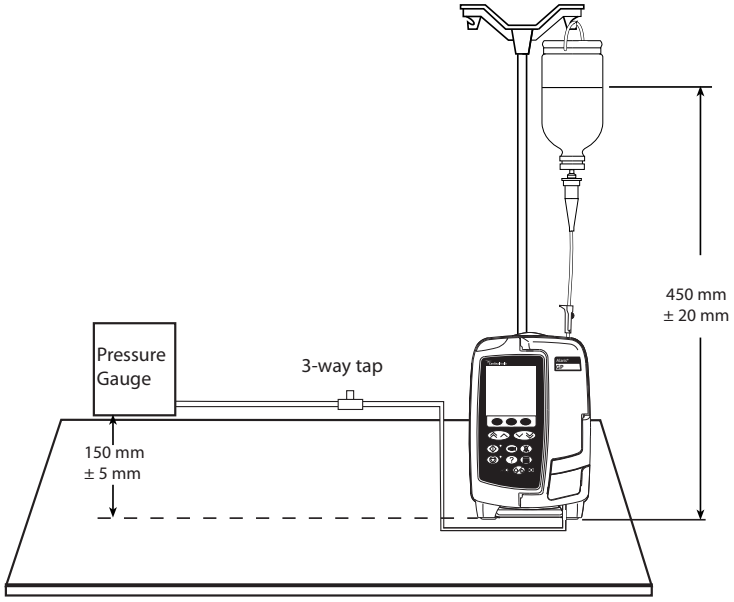
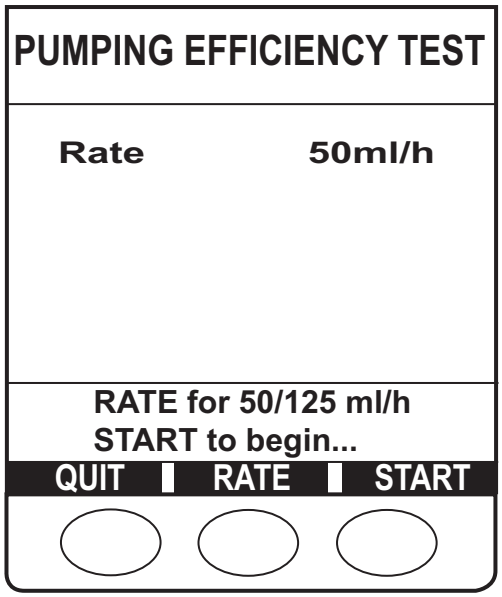
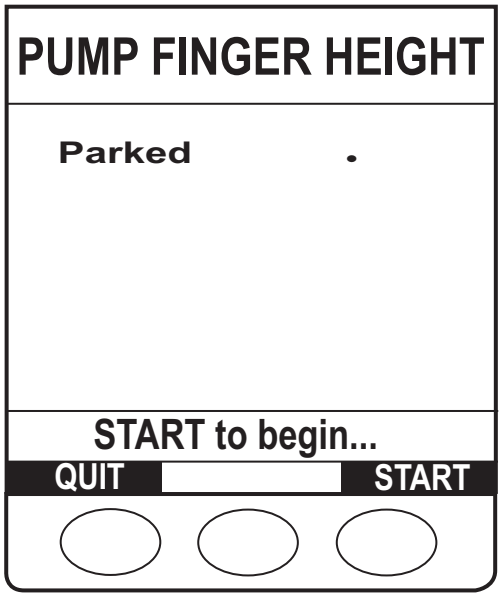


Figure 3 - 1 Pressure Tests Equipment Set Up



Pump Finger Height (Parking Test)

1. Press the **START** softkey to begin.
2. Mechanism will run and park.
3. Press **DONE** softkey to confirm and exit.



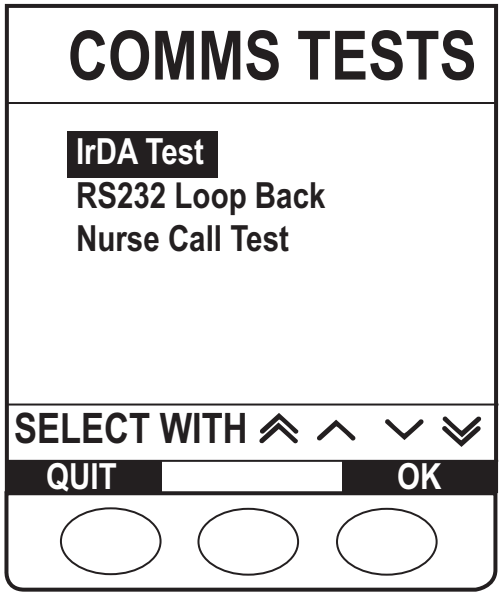
Service Mode - Test Verification/PVP (continued)

COMMS Test

Select the required option using the ⇈⇑⇓⇊ keys and the **OK** softkey.

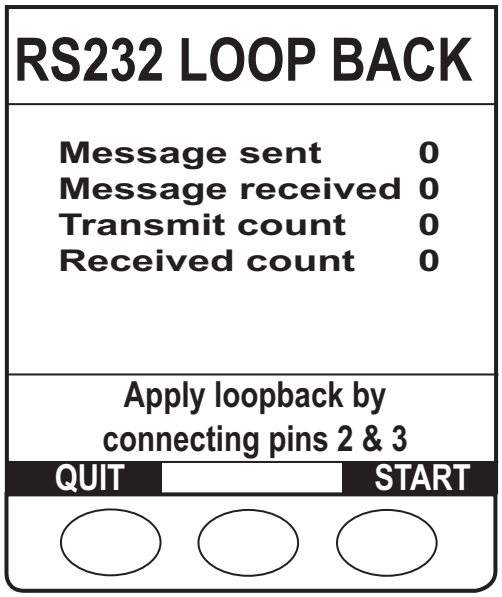
IrDA Test	Check IrDA operates correctly.
RS232 Loop Back	Check RS232 operates correctly.
Nurse Call Test	Check Nurse Call operates correctly.

IrDA Test requires specialist equipment.
For further details please contact Cardinal Health.



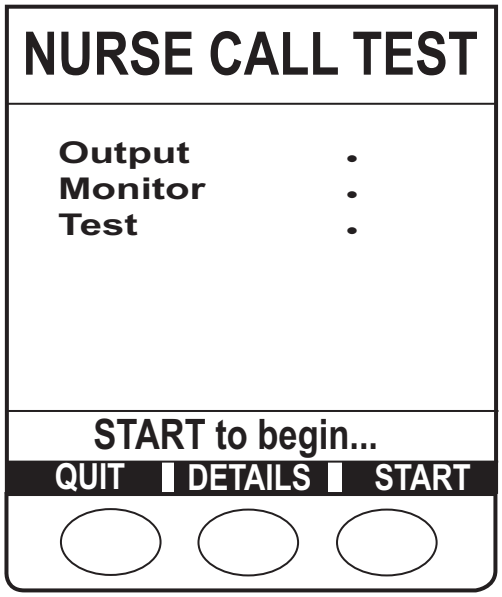
RS232 Loop Back

1. Link pins 2 & 3 of the RS232 connector on rear of the pump.
2. Press the **START** softkey to begin.
3. Check RS232 operation is correct and ✓ for pass are shown after each item. If RS232 Test fails a ✕ is displayed to indicate the failure.
4. Press **PASS** softkey to confirm pass and exit.



NURSE CALL TEST

1. Press the **START** softkey to begin.
2. Check Nurse Call operation is correct and ✓ for pass are shown after each item. If Nurse Call fails a ✕ is displayed to indicate the failure.
3. Press **PASS** softkey to confirm pass and exit.



Service Mode - Test Verification/PVP (continued)

Occlusion Test

This test can be only done as part of the PVP Work Flow.

Use the Infusion Set ten times only and then replace. Record how many times the Infusion Set has been used.
Note: The Occlusion Pressure Test is carried out with fluid in the Infusion Set.
This test is used to confirm that the pressure sensor is correctly calibrated and able to detect an occlusion at the correct line pressure. This is done by pumping into a calibrated pressure gauge and checking that an alarm occurs at the correct line pressure. The test set-up is as per figure 3 - 1.

1. Put the fluid filled Infusion Set (60793) into the Pump.
2. Enter the **PVP Work Flow** and proceed to the **Occlusion Pressure Test**.
3. Open the 3-way tap to atmosphere then press the **LEVEL** softkey to adjust the alarm level to **L5**.
4. Configure the Calibrated Pressure Gauge to hold the Peak/MAX Pressure reading, in preparation for the test.
5. Press the **START** softkey to begin running the Pump at a rate of 125ml/h. Allow the Pump to run for 1 minute, so that the pressure reading stabilises.
6. Turn the tap to occlude the Infusion Set into the pressure gauge.
7. The Pump will continue to infuse and it will be observed that the pressure reading increases. Eventually a high-pressure alarm will occur and the Pump will stop infusing. Note the reading on the pressure gauge and confirm that it is **500mmHg ±100mmHg.**
7. Press **PASS** softkey if Pump passes test at all levels.

If the pressure is outside of tolerance pressure calibration is required. Calibration should be performed as per procedure in Chapter 2 'Configuration and Calibration'. If the pump continues to fail the occlusion test then the pressure sensors should be replaced and perform the calibration procedure again.

Occlusion Test (Optional)

This test can be done in normal operating mode to check the occlusion without having to perform the full PVP Work Flow.

Use the Infusion Set ten times only and then replace. Record how many times the Infusion Set has been used.
Note: The Occlusion Pressure Test is carried out with fluid in the Infusion Set.
This test is used to confirm that the pressure sensor is correctly calibrated and able to detect an occlusion at the correct line pressure. This is done by pumping into a calibrated pressure gauge and checking that an alarm occurs at the correct line pressure. The test set-up is as per figure 3 - 1.

1. Put the fluid filled Infusion Set (60793) into the Pump.
2. Press the button to turn the pump on.
3. Open the 3-way tap to atmosphere.
4. Set the Rate to 125ml/h.
5. Press the **VTBI** softkey and set VTBI to 10ml.
6. Press the button and set the Pressure Alarm Limit to **L5**.
7. Configure the Calibrated Pressure Gauge to hold the Peak/MAX Pressure reading, in preparation for the test.
8. Press the button to begin running the Pump at a rate of 125ml/h. Allow the Pump to run for 15 seconds, so that the pressure reading stabilises.
9. Turn the tap to occlude the Infusion Set into the pressure gauge.
10. The Pump will continue to infuse and it will be observed that the pressure reading increases. Eventually a high-pressure alarm will occur and the Pump will stop infusing. Note the reading on the pressure gauge and confirm that it is 500mmHg ±100mmHg.
11. Open the 3-way tap to atmosphere.
12. Hold the button down for approximately three seconds to turn the pump off.

If the pressure is outside of tolerance pressure calibration is required. Calibration should be performed as per procedure in Chapter 2 'Configuration and Calibration'. If the pump continues to fail the occlusion test then the pressure sensors should be replaced and perform the calibration procedure again.

Service Mode - Test Verification/PVP (continued)

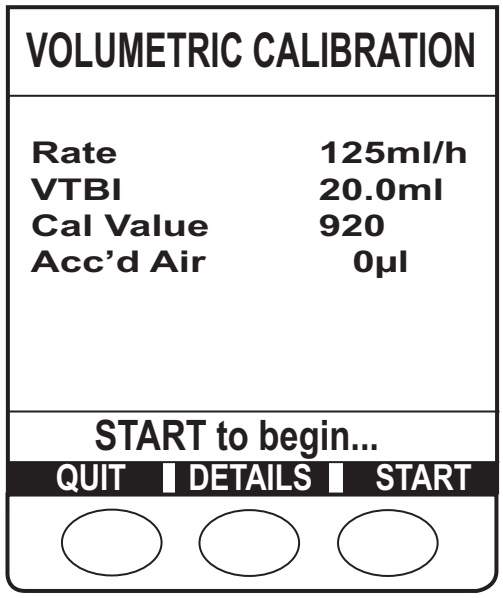
Volumetric Accuracy

This test can be done as part of the PVP Work Flow or in the calibration menu.

1. Load the Infusion Set (60793) into the Pump and set-up as shown in Figure 3-2 below and adjust the fluid level so that the meniscus is level with the zero mark.
2. Press **START** to begin. Test will run and fluid will be delivered into the burette.
3. When **Volume delivered!** is displayed, check accumulated air in line value is less than 100µl then enter the volume delivered into the burette using the keys and the **OK** softkey. If accumulated air in line value is greater than 100µl then repeat test.

If measured value is 19.3ml or less then enter 19.2ml and if values is 20.6ml or higher then enter 20.7ml.

4. If no calibration is required then press **PASS** to confirm and exit.
5. If the Calibration value is changed automatically then press **VERIFY** and repeat steps 2 to 4.
6. If the pump still fails replace the Platen and Fingers then repeat the calibration procedure.



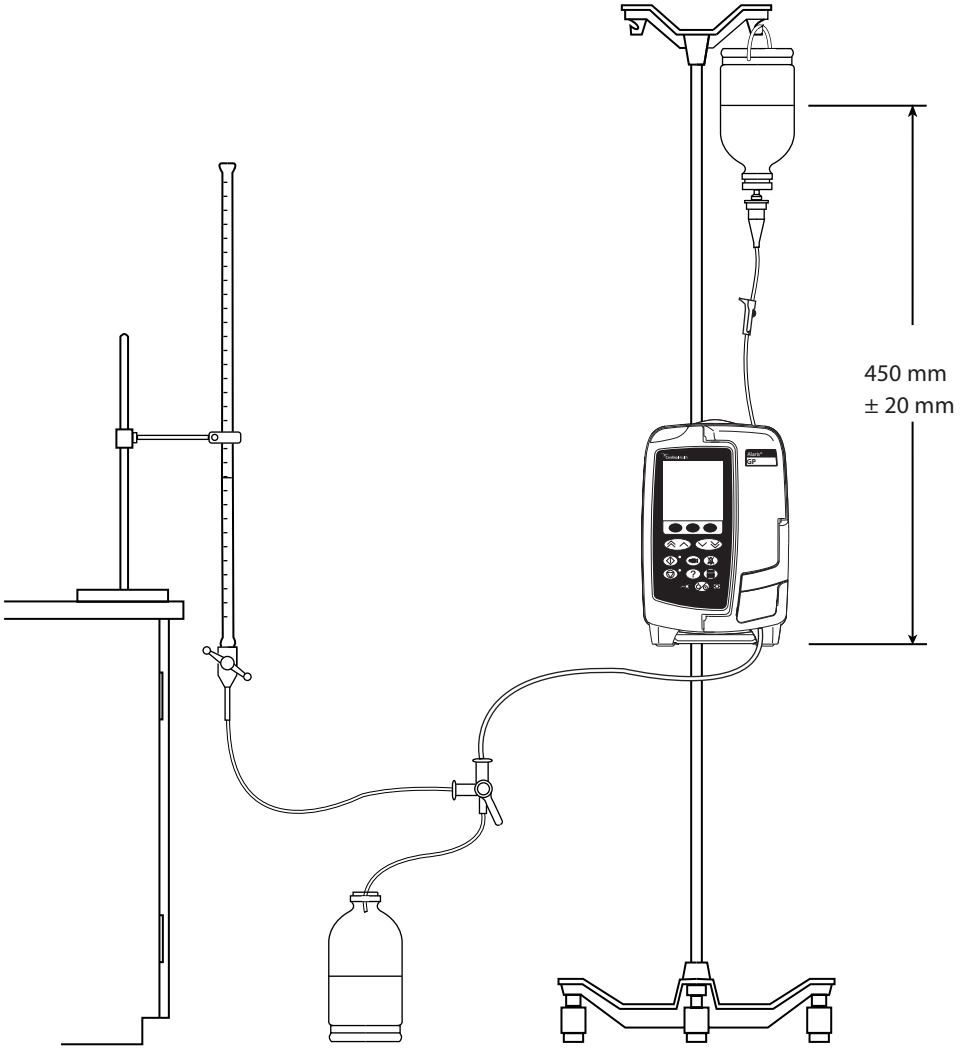


Figure 3 - 2 Volumetric Accuracy Equipment Set Up

Performance Verification Procedure

Model / Serial Number:		**Service Order / Inventory Number:**
Hospital Name / Reference:		**Software Version:**
INSPECTION	**Physical inspection and clean** [CH3]	

SELF TEST [CH3]	**Check all functions in PVP Work Flow**
	Enter access code **212** and go to **PVP Work Flow**
	• Software Versions
	• Date/Time
	• Serial Number
	• Door Frame
	• Safety Clamp
	• Sear
	• Audio Test
	• Chequerboard
	• LED's
	• Keypad
	• Nurse Call
	• RS232 Loop Back
	• Pumping Efficiency Test
	  • Time taken = 2 minutes or less _____ minutes _____ seconds
	• Downstream Occlusion Pressure Test
	  • Occlusion alarm = 500 ± 100 mmHg L5 _____ mmHg
	• Alarms Functionality
	• Volumetric (Accuracy Test) Calibration
	  • Delivery = 20 ml ± 0.6 ml (3%) _____ ml	

SETUP	**Set rate to zero (or lowest value possible), clear Volume Infused and VTBI**	
ELECTRICAL SAFETY TESTS	**Class I Type CF** *Alternatively attach printed test results* Earth Resistance Test <= 0.2 Ω Earth Leakage Current <= 500 µA Enclosure Leakage Current <= 100 µA	_____ Ω _____ µA _____ µA
Verification Performed By	_____ **Sign**	_____ **Print** _____ **Date**

[CHX] **indicates the chapter number in the Technical Service Manual (TSM) - 1000SM00013.**
E.G. [CH2] **= Refer to TSM Chapter 2.**

Chapter 4

Troubleshooting

In this Chapter

Log Downloads	40
Introduction	41
Software Fault Codes	41
General Fault Diagnosis	43
Exception Error Handling	43

Log Downloads

PC Setup (first time only)

1. Navigate through the **Start** menu, select **Settings**, then **Network Connections**.
2. Select **New Connection Wizard**.
3. Click **Next**.
4. Select **Set up an advanced connection** option and click **Next**.
5. Select **Connect directly to another computer** option and click **Next**.
6. Select **Guest** option and click **Next**.
7. Enter ***AlarisGP*** as the Computer Name and click **Next**.
8. Select the appropriate COM port and click **Next**.
9. Select the **Connection Availability** required and click **Next**.
10. Tick check box if a shortcut is required on the desktop and click **Finish**.
11. Connect ***AlarisGP*** Dialog box is displayed and click **Properties**.
12. On General tab click **Configure**.
13. Set **Maximum speed (bps):** to **115200**, uncheck **Enable Hardware flow control** and click **OK**.
14. On Options tab check **Display progress while connecting** and uncheck **Prompt for name and password, certificate, etc.**.
15. On Security tab click **Settings**.
16. Check **Unencrypted password (PAP)** only and click **OK**. Click **Yes** on the confirmation dialog that is displayed
17. On Networking tab click **Settings**.
18. Check **Enable LCP extensions** and **Enable software compression** then click **OK**.
19. Check **Internet Protocol (TCP/IP)** and **QoS Packet Scheduler**, highlight **Internet Protocol (TCP/IP)** then click **Properties**.
20. Check **Use the following IP address** and enter an IP address of **192.168.3.2** then click **Advanced**.
21. Uncheck **Use default gateway on remote network** and click **OK**.
22. Click **OK**.
23. Click **OK**.
24. The PC will dial the pump, refer to download procedure.

PC Setup (second time)

1. Navigate through the **Start** menu, select **Settings**, then **Network Connections** ***AlarisGP***.
2. The PC will dial the pump.
3. Refer to download procedure.

Event Log Download

1. Switch the pump on in Service Mode.
2. Once communication is established open a web browser and enter **http://192.168.3.1** into the address bar.
3. Download log.

Warning -
At no time should the Event Log be downloaded while the pump is connected to a patient.

For pumps with software version v1.9.x and above also download the Presentation Style Sheet to enable the logs to be viewed (this file only needs to be downloaded once). Also the downloaded event log needs to be stored in the same directory as the Presentation Style Sheet. To view the downloaded event log open file with Microsoft Excel and select style sheet.

Introduction

Use this troubleshooting guide to help identify the cause of errors and faults which may occur as a result of damage to the pump or failure of an internal component. The following table lists the error messages and describes what action to take to resolve the problem. A general fault diagnosis checklist is also provided. For information on alarm procedures and messages, refer to the *DFU*.

Software Fault Codes

Code	Module	Failure	Action/Replace
DFS1	Door Flow Stop	Flow Stop Sensor Fault	Clean AIL/Safety Clamp Housing. Check connections and cables. AIL/Safety Clamp Housing.
DFS2		Sear Sensor Fault	
DFS3		Platen Fault	Check door sensor and door are correctly positioned and not damaged. Door sensor, door or pressure sensors.
DFS4		Hall Fault	
DFS5		Pressure System Fault	Pressure Sensors or Interface PCB.
DRV1	Drive	Park Fault	Chassis or Interface PCB.
DRV2		Motor Control Fault	
DRV3		Linearisation Fault	
DRV4		Inhibit Fault	Check Connections between Control and Interface PCBs. Chassis, Interface PCB or Control PCB.
DRV5		Rate Control Fault	Chassis or Interface PCB.
DRV6		Calibration Fault	Calibrate the pump. SD Card, Chassis or Interface PCB.
DSP1	Downstream Pressure	Sensor Fault	Downstream pressure sensor, Interface PCB or cable.
DSP2		Calibration Fault	Calibrate pressure. SD Card, Downstream pressure sensor, Interface PCB or cable.
FLD1	Fluid Channel	Stale Fault	Check Connections between Control and Interface PCBs. Interface PCB.
FLD2		Volume Display Fault	
FLW1	Drip Chamber	Measurement Fault	Check Flow Sensor. Try another Flow Sensor. Check cable connections to Interface PCB. Comms PCB or Interface PCB.
HDW1	Hardware	Excess Interrupts	Control PCB or Interface PCB.
HDW2		Stale	
HDW3		Platform Fault	
HDW4		Serial Number Corrupt	
HDW5		ADC Reference Failure	
IFS1	File System	Persistent Storage Fault	SD Card or Control PCB.
IFS2		Policies Cfg Fault	Configure and calibrate pump. SD Card or Control PCB.

Software Fault Codes (continued)

Code	Module	Failure	Action/Replace
MMI1	MMI	Primary Audio Fault	Speaker, Control PCB or Interface PCB.
MMI2		Stuck Key Fault_Stop	Key has been registered as stuck for 2 minutes. Check keypad operation in Service Mode. Keypad or Control PCB.
MMI3		Stuck Key Fault_Start	
MMI4		Stuck Key Fault_OnOff	
MMI5		Stuck Key Fault_IncInc	
MMI6		Stuck Key Fault_Inc	
MMI7		Stuck Key Fault_Dec	
MMI8		Stuck Key Fault_DecDec	
MMI9		Stuck Key Fault_Menu	
MMI10		Stuck Key Fault_Bolus	
MMI11		Stuck Key Fault_Soft1	
MMI12		Stuck Key Fault_Soft2	
MMI13		Stuck Key Fault_Soft3	
MMI14		Stuck Key Fault_Mute	
MMI15		Stuck Key Fault_Pressure	
POW1	Power Monitor	Battery Fault	Battery or Control PCB.
POW2		Charge Fault	
PRG1	Program	Flow Control Fault	SD Card, Control PCB or Interface PCB.
PRG2		Abort Fault (Prg)	
PRG3		Abort Fault (data)	
PRG4		Critical Data Corruption Fault	
PRG5		Image Corruption	
PRG6		Assertion Fault	
REM1	Remote Comms	Nurse Call Failure	Check Comms connections. Comms PCB or Control PCB.
RTC1	Instrument	RTC Init Failure	Configure clock. Perform cold start. Control PCB.
RTC2		RTC Overflow Imminent	
SCM1		Pump Crisis	Switch pump off and then back on. Contol PCB or Interface PCB.
USP1	UpstreamPressure	Sensor Fault	Upstream pressure sensor, Interface PCB or cable.
USP2		Calibration Fault	Calibrate pressure. SD Card, Upstream pressure sensor, Interface PCB or cable.

General Fault Diagnosis

Failure	Action/Replace
Display missing vertical lines	If Control PCB is issue 9 and below, then replace with latest issue Control PCB.
No response from keypad or LED	
Safety alarm is activated	
Failure of RS232 communications	Replace Comms PCB.

		Parts to Check/Test											
		Front Case	Rear Case	Labels & Keypads	Mechanism	Control PCB	Interface PCB	Power PCB	Display PCB	Door	Battery	Mains Lead	Fuses
General Fault	Dropped or damaged	✓	✓		✓	✓	✓	✓	✓	✓			
	Exposed to fluids	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	No battery power			✓		✓	✓				✓		
	No AC mains power			✓		✓	✓	✓				✓	✓
	Delivery rates out of tolerance	✓			✓	✓	✓			✓			

Exception Error Handling

Exception errors include Assertion Errors and are used to trap logical errors in the software execution.

The pump will display the error type, the title of the software module in which the error occurred and the line number. The user should make a note of these for use in diagnosis. This information is stored in the event log.

After an error, the pump will not store information when powered down. When the pump is switched on again, the user should always confirm clear setup.

Chapter 5

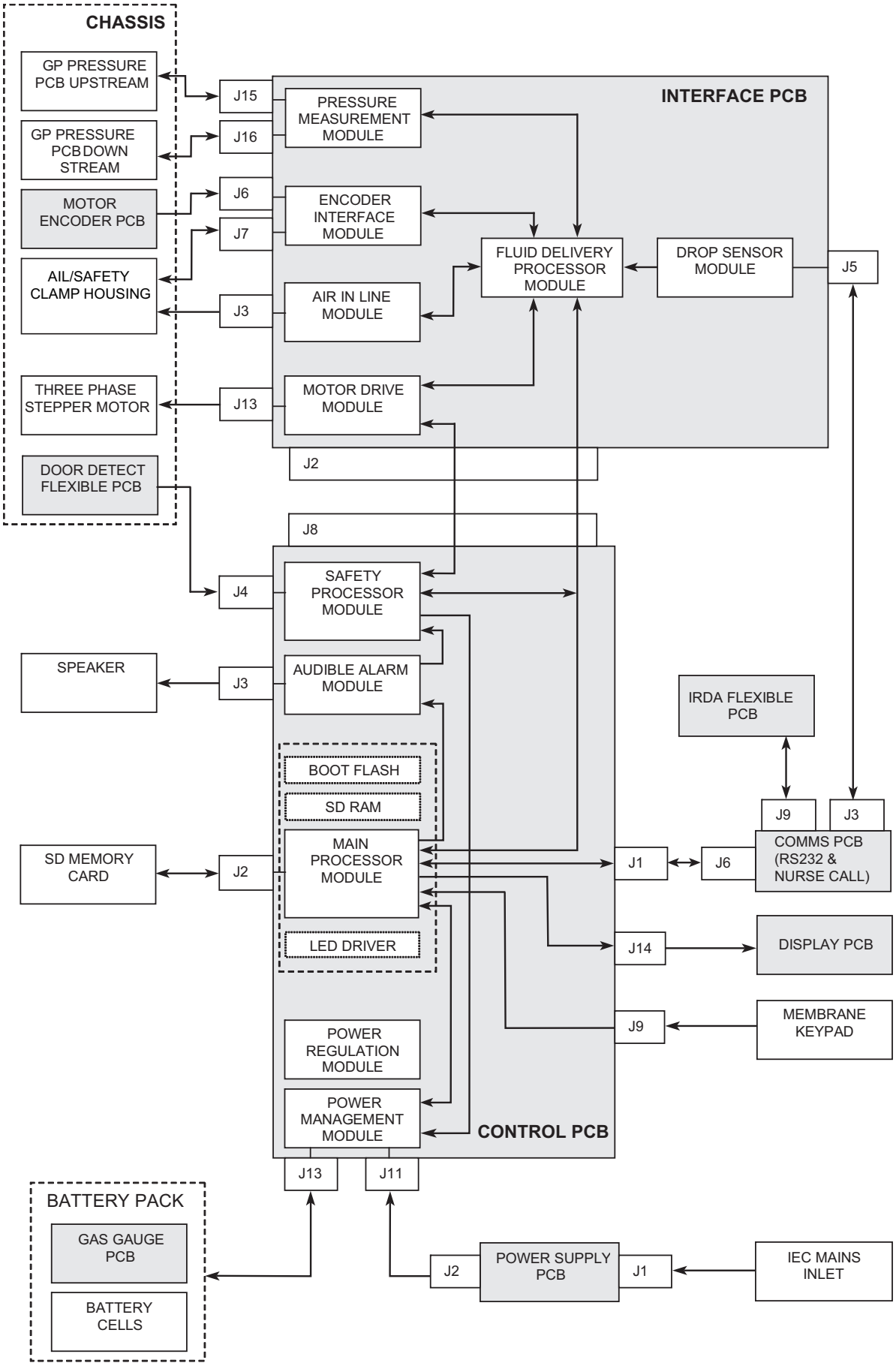
Circuit Descriptions

In this chapter

Functional Module Block Diagram 45

Module Overview Functional Description 46

Functional Module Block Diagram



Module Overview Functional Description

The Pumps are designed to be serviced generally to major assembly level. The PCBs are designed as non-serviceable items and as such, can only be replaced as complete parts.

The major assemblies are:

- Control PCB
- Display PCB
- IrDA Flexible PCB
- Motor Encoder PCB
- Door Detect Flexible PCB
- Power Supply PCB
- AIL/Safety Clamp Housing
- Interface PCB
- Comms PCB
- GP Pressure PCB x 2
- IEC Mains Inlet
- Battery Pack
- Membrane Keypad
- Motor

Cardinal Health will make available, on request, circuit diagrams which will assist appropriately qualified technical personnel to repair those parts of the device which are designated by the manufacturer as repairable.

Control PCB

The Control PCB is broken into a number of functional blocks. A description of each block follows:

- Main Processor Module

At the heart of the system, the main processor provides all the high level control functionality. It processes data provided by the safety processor and fluid delivery processor and provides the interface to the user via the display, keypad, audible alarm and LED driver. It also provides external communications via the RS232 Nurse Call and IrDA interfaces. The main processors memory consists of a secure digital (SD) memory card (Industrial Grade) SDRAM and Boot Flash. The firmware is stored on the SD card and copied into the SDRAM at power-up and executed. Event logs, calibration information and other systems configuration information are also stored on the SD card.

- Safety Processor Module

Running from an independent power supply provided by a rechargeable lithium coin cell battery the safety processor monitors the operation of the main processor and fluid delivery processor. In the event of a fault it is able to sound a secondary alarm, illuminate the alarm beacon and stop the motor. It also provides real time clock and power on / off functionality.

- Power Management and Power Regulation Modules

The power management module consists of a multi-chemistry smart battery charger controlled by the gas gauge within the battery pack. Power from the battery and the mains power supply unit is routed through a number of switches which provide a smooth transition between mains and battery operation. The power regulation module provides regulated supply rails for the display back light and the digital and analogue systems.

- Audible Alarm Module

The primary audible alarm controlled by the main processor module and independently monitored by the safety processor. Alarm tones are derived from a PWM signal generated by the main processor. The signal is passed through a limiter and active filter before being amplified and output via the speaker. The safety processor measures the amount of current passing through the speaker to determine correct operation.

Interface PCB

The Interface PCB provides all the low level control and monitoring functionality of the system. It is broken into the following functional blocks:

- Fluid Delivery Processor Module

This module provides the interface between the motor drive and sensor systems and the main processor.

- Drop Sensor Module

This module provides the interface between the fluid delivery processor and an IVAC® 180 Flow Sensor. It incorporates automatic gain control to minimise the effects of fogging and changes in ambient light levels. Connection of the drop sensor is automatically detected.

- Pressure Measurement Module

The fluid delivery processor connects to the upstream and downstream pressure transducers via its internal analogue to digital converter. The fluid delivery processor is able to determine if the sensors are working correctly by monitoring the voltage across the force transducer and by switching in a known off set to the amplifier.

- Encoder Interface Module

Using optical encoders the fluid delivery processor is able to determine the direction and speed of the motor, the position of the cam, the status of the door seers and the flow stop device.

- Air In Line Module

This is an ultrasonic system used to detect air bubbles in the line. A swept frequency signal is used to excite the piezo crystals in the AIL/Safety Clamp Housing. When fluid is present in the tube the signal is coupled across the gap and received by another piezo crystal. The received signal is amplified and passed through a detector to indicate whether air or fluid is present in the line.

- Motor Drive Module

The fluid delivery processor generates three PWM control signals which are used to determine the amount of current flowing through each phase of the stepper motor. The motor is driven using micro steps. The Safety Processor is able to prevent operation of the motor if it believes that a system fault has occurred.

Module Overview Functional Description (continued)

Display PCB

This is an ISTN negative mode graphics display with built in temperature compensation.

Comms PCB and IrDA Flexible PCB

Data from the main processor is routed via this board to either the isolated RS232 interface or the IrDA interface. An isolated nurse call interface is also provided via the RS232 connector. The status of the nurse call relay is monitored and fed back to the safety processor.

GP Pressure PCB

Two pressure boards are used, one above the pumping mechanism to measure upstream pressure and one below to measure down stream pressure. The tubing is compressed against a force transducer. As pressure builds up in the line the tubing expands and hence the force measured increases. Similarly as the pressure falls the tubing contracts and the force decreases. The software converts the force into a relative pressure measurement. The pressure board contains a silicon bridge force sensor, an instrumentation amplifier and diagnostic systems to check gain and the voltage across the force sensor.

Motor Encoder PCB

The Motor Encoder PCB sits above the encoder wheel. The wheel consists of two discs one with multiple teeth the other with a single slot. The wheel with the multiple teeth runs through a dual channel slotted optical switch which produces two digital encoder signals. The fluid delivery processor is able to interpret the phase and frequency of these signals to determine the speed and direction of the cam shaft. The disc with the single slot runs through a single channel slotted optical switch that produces a single digital signal from which the mechanism can be set into the park position.

Air In Line(AIL)/Safety Clamp Housing

The AIL/Safety Clamp Housing contains the ultra sonic piezo transducers used by the air in line system.

These transducers connect to the Interface PCB via the Air In Line Flexible PCB. A reflective optical sensor in the AIL/Safety Clamp Housing allows the fluid delivery processor to determine the status of the seers used to retract the flow stop. A photo transistor and a photo diode are used to determine if the Safety Clamp slide is open or closed. All the drives to the optical sensors are modulated to prevent cross talk and determine correct operation. The optical sensors connect to the Interface PCB via the Safety Clamp Detect Flexible PCB.

Door Detect Flexible PCB

The status of the door is monitored using a magnet embedded in the door frame and a digital Hall Effect device mounted on the end of the Door Detect Flexible PCB.

Battery Pack

The battery pack contains a smart gas gauge device that provides charge information to the charger and the status of the battery (capacity, voltage, current and temperature) to the main processor. The pack also contains a thermal fuse and thermal cut out. The battery will be charged when ever the unit is connected to the main supply.

Power Supply

A universal input switched mode power supply used to regulate the mains input voltage.

Membrane Keypad

The membrane keypad consists of fourteen keys and LED's to indicate battery, mains, start and stop. The on / off key connects to the main processor and the safety processor. The safety processor manages the power up sequence and the main processor power down.

IEC Mains Inlet

A medical grade filtered mains inlet with fuses in the live and neutral lines. The fuses can be accessed by removing the external splash cover and opening the fuse draw.

Motor

A three phase stepper motor coupled to the cam shaft by a toothed drive belt. The motor does 5,689 microsteps per ml.

Chapter 6

Corrective Maintenance

In this chapter

Corrective Maintenance	49
Torque Guide	50
Access To Pump	51
Rear Case and Subassemblies	53
Front Case and Subassemblies	59
Keypads and Labels	66

Corrective Maintenance

Ensure the pump is disconnected from the AC power supply and switched off before attempting to service.

⚠The pump contains static-sensitive components and therefore strict ESD precautions should be observed at all times.

Batteries should be disposed of as outlined by the local country regulations. Do not send batteries back to the manufacturer.

Only use Cardinal Health recommended spare parts.

This chapter contains procedures required to properly disassemble, repair and replace parts and then to reassemble the pump.

Following all spare part replacement and repair activities, testing must be performed in accordance with the Performance Verification Procedure (PVP), see Chapter 3, 'Preventative Maintenance'. Additional testing and calibration may be required after certain repairs are completed, see table below for more information.

		Repair/Replacement of											
		Front Case	Rear Case	Labels & Keypads	Chassis / Pump Mechanism	Control PCB	Power PCB	Display PCB	Interface PCB	Battery	Pressure Sensors	Door	AIL/Safety Clamp Housing
Test/calibration to perform	Performance Verification Procedure	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Battery Calibration					✓	✓			✓			
	Volumetric Verification / Calibration	✓			✓	✓					✓	✓	✓
	Zero Point Calibration	✓			✓	✓					✓	✓	✓
	Pressure Calibration	✓			✓	✓					✓	✓	✓

✓ = Required
Blank = Optional

Torque Guide

The torque levels established during the manufacturing process are outlined in this chapter, for example *40cNm*. Torque levels selected apply throughout product life.

Use the information as a guide to the 'do not exceed' torque levels when servicing the pump. When servicing, it is recommended that torque is applied gradually until the component is secure. In any process do not exceed the stated levels.

If a torque driver is available for servicing this will help control the applied torque; otherwise, be aware that excess force may cause the component to fail.

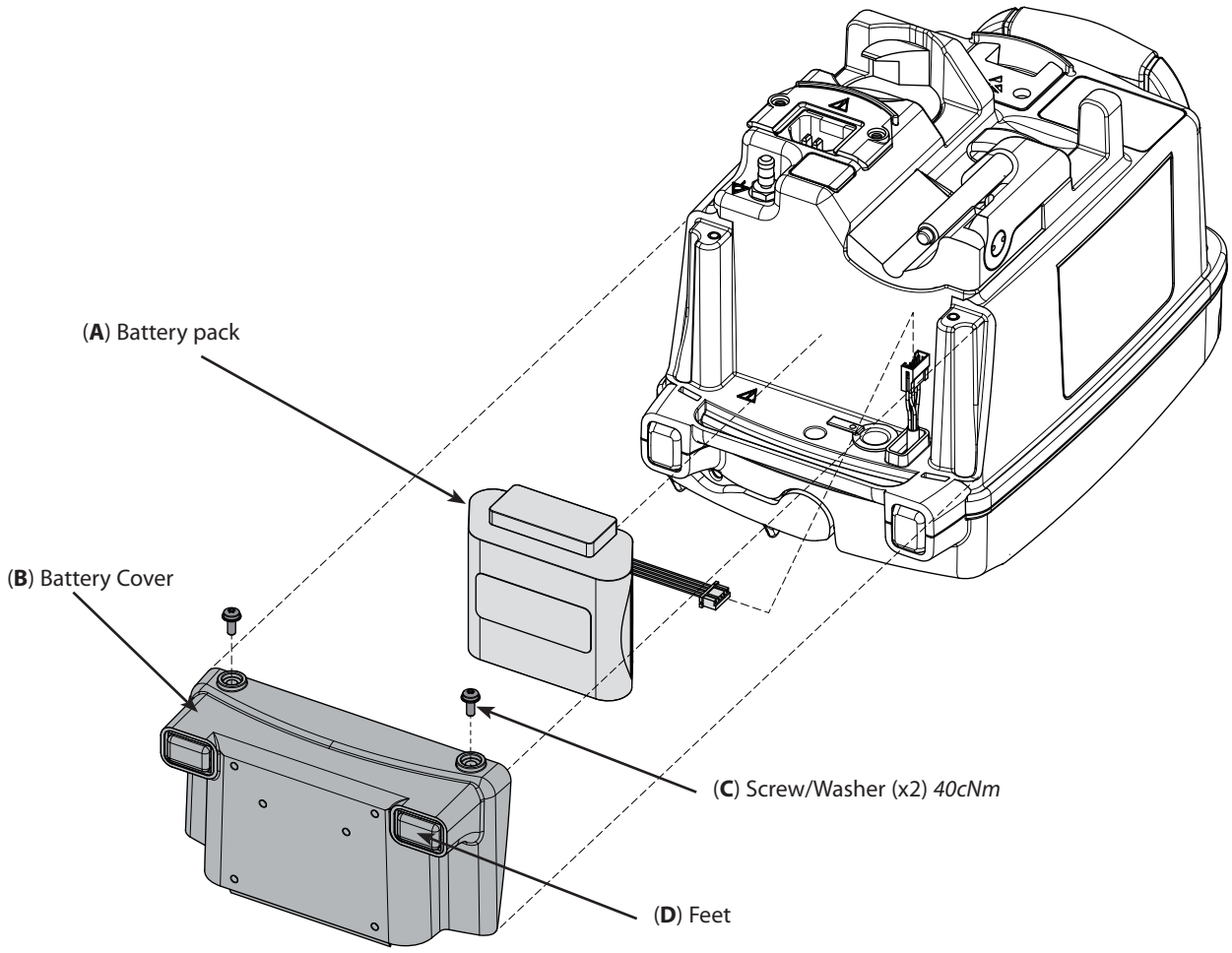
Where a torque level is not stated then fixing should be hand-tight.

- Always use the correct torque level when performing an assembly stage.
- Take care with the torque applied when re-assembling parts.
- The head patterns of the fasteners are of the following types:
  - Torx T8
  - Torx T10
  - Allen key 2mm
  - Small flat blade
  - Hex 4.5mm
  - Hex 10mm
- Always select the correct tool and bit pattern for the fastener.

Access To Pump

Replacement Procedure

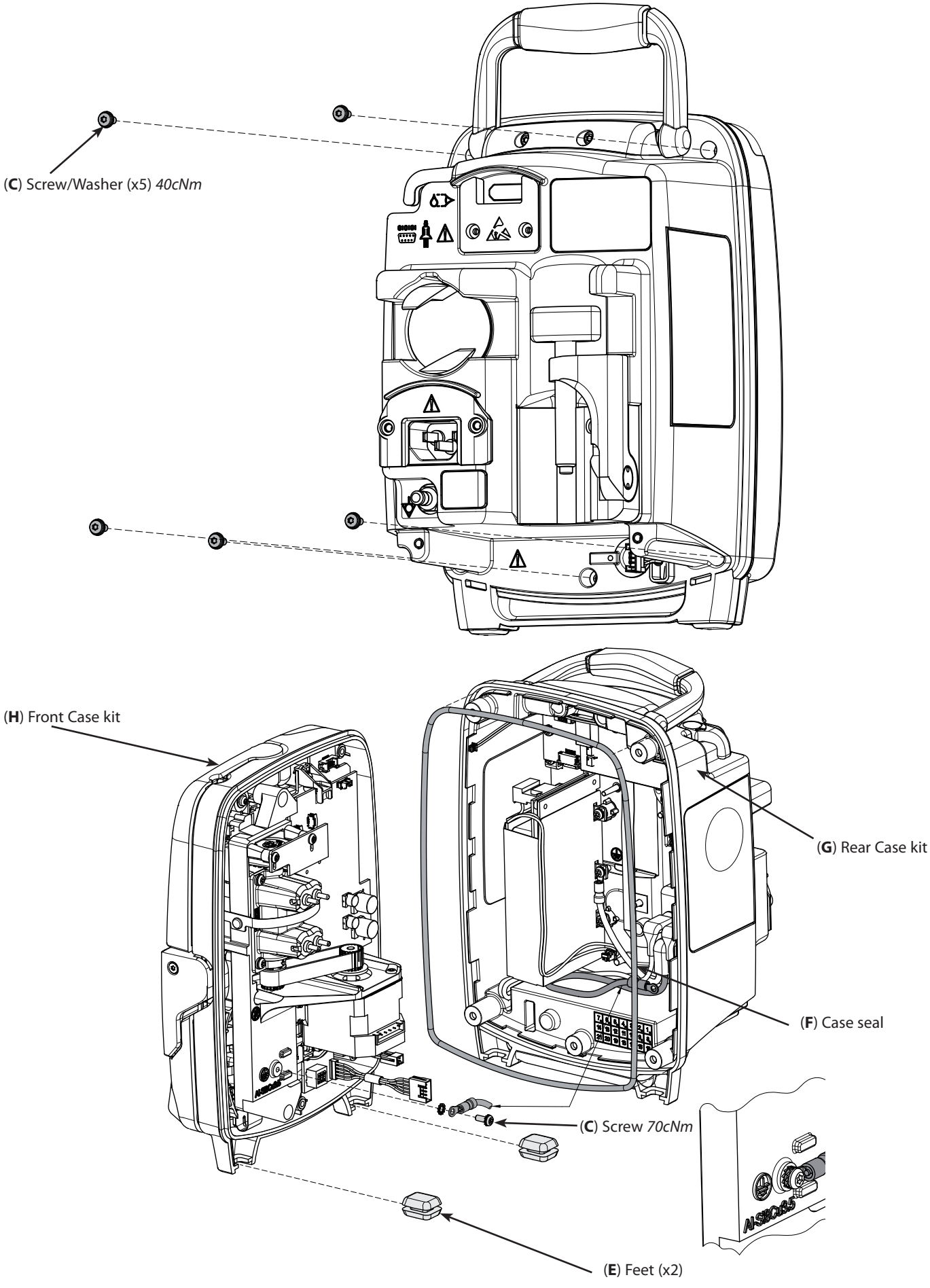
1. Remove the two case screws with integral flat washer in battery cover, remove cover and battery.
2. Remove the five case screws with integral flat washer .
3. Carefully separate case halves.
4. Remove screw holding earth cable to mechanism and disconnect four other cables.
5. Where necessary, remove the feet and/or seal.
6. Reassemble in reverse order.



Spare parts

Item	Description	Part Number
A	Asena LVP Battery Pack	1000SP00487
B	Cover Battery Asena LVP	1000ME00589
C	Alaris GP Fastener Spares Kit	1000SP01252
D	Foot Battery Cover Asena LVP	1000ME00590
E	Foot Front Asena LVP	1000ME00649
F	Seal Case Nickel/graphite	1000ME01611
G	Alaris GP Rear Case Kit	1000SP01250
H	Alaris GP Front Case Kit	1000SP01248

Access To Pump (continued)

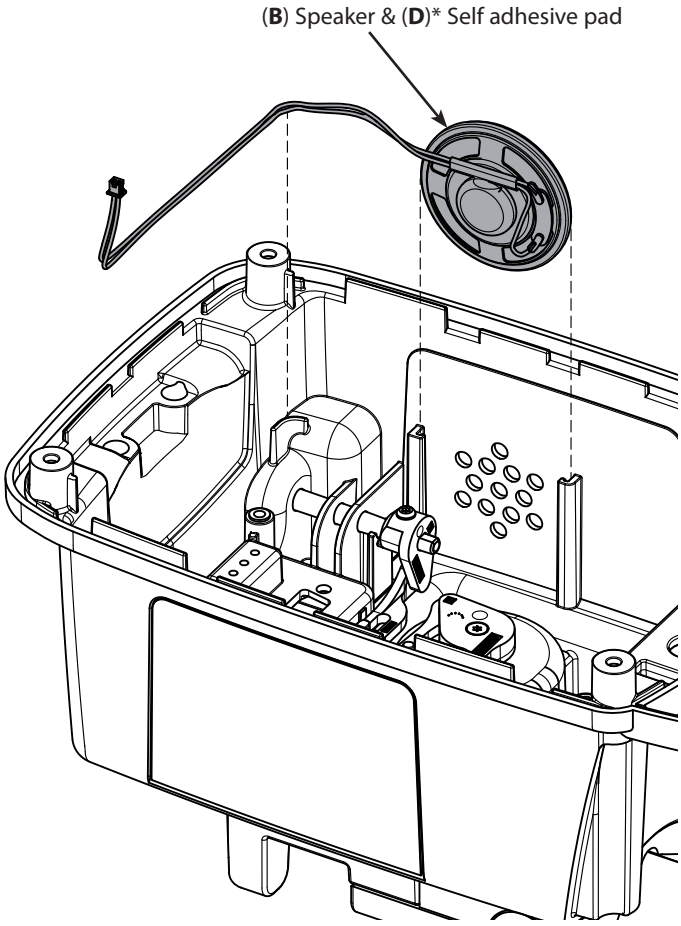


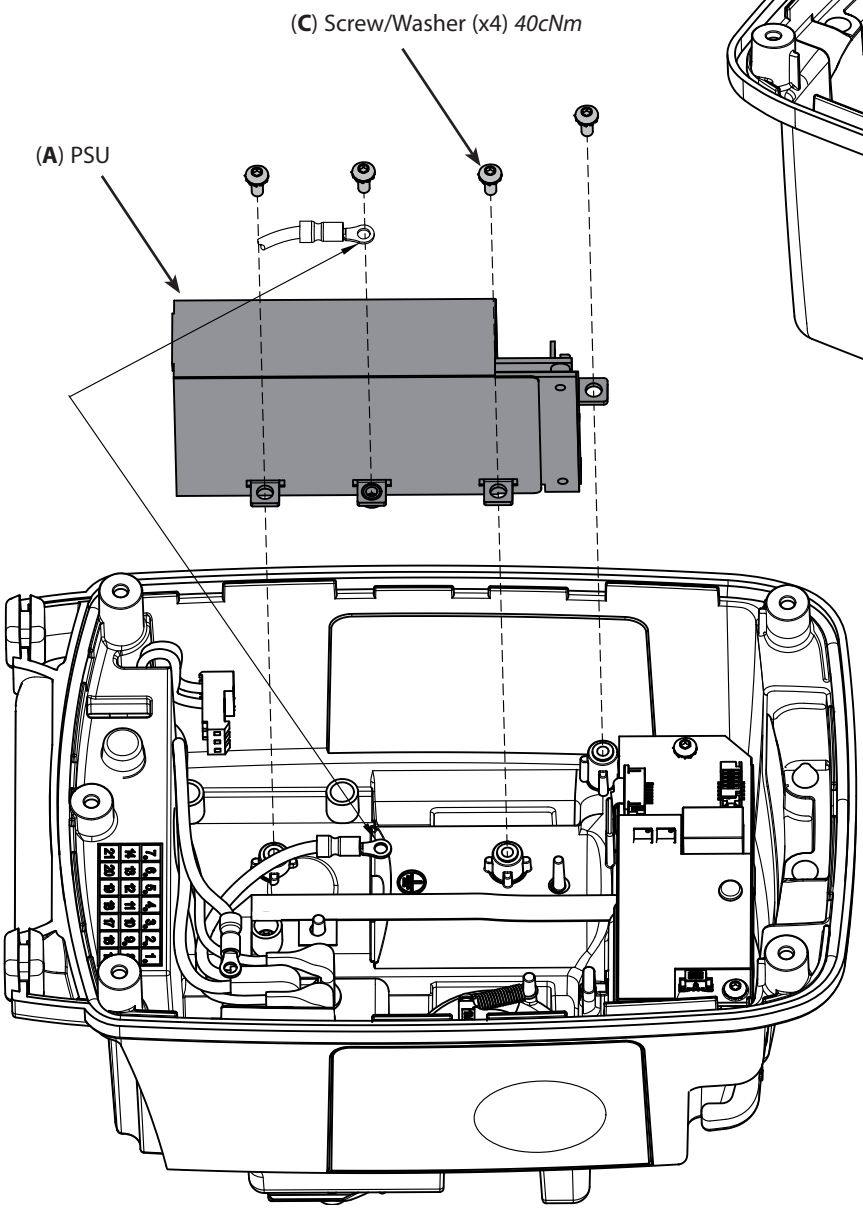
Rear Case and Subassemblies

Power Supply Unit (PSU) & Speaker

Replacement Procedure

1. Disconnect the Mains Inlet cable.
2. Remove the three PSU screws.
3. Remove earth wire screw and washer.
4. Remove PSU and insulator.
5. Pull the speaker up and out.
6. Reassemble in reverse order.





Spare parts

Item	Description	Part Number
A	Alaris GP PSU PCB Kit	1000SP01305
B	Alaris GP Speaker KIt	1000SP01306
C	Alaris GP Fastener Spares Kit	1000SP01252
D*	Pad Self Adhesive Double Sided 12x12mm	0000ME00423

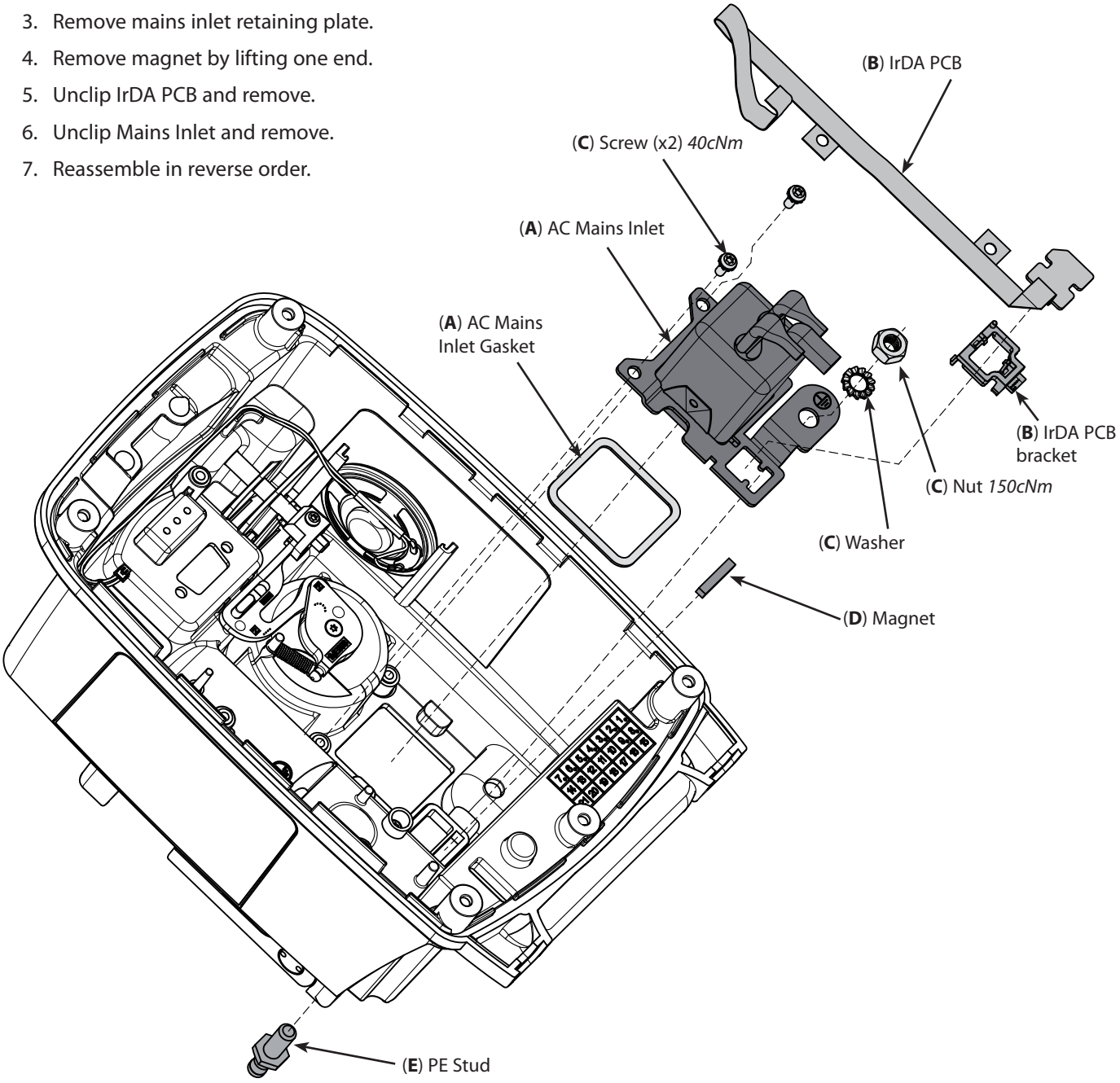
* Item not shown

Rear Case and Subassemblies (continued)

Mains inlet, IrDA PCB, PE stud and magnet

Replacement Procedure

1. Remove nut and washer to remove PE stud.
2. Remove the two screws on Mains inlet retaining plate.
3. Remove mains inlet retaining plate.
4. Remove magnet by lifting one end.
5. Unclip IrDA PCB and remove.
6. Unclip Mains Inlet and remove.
7. Reassemble in reverse order.



Spare parts

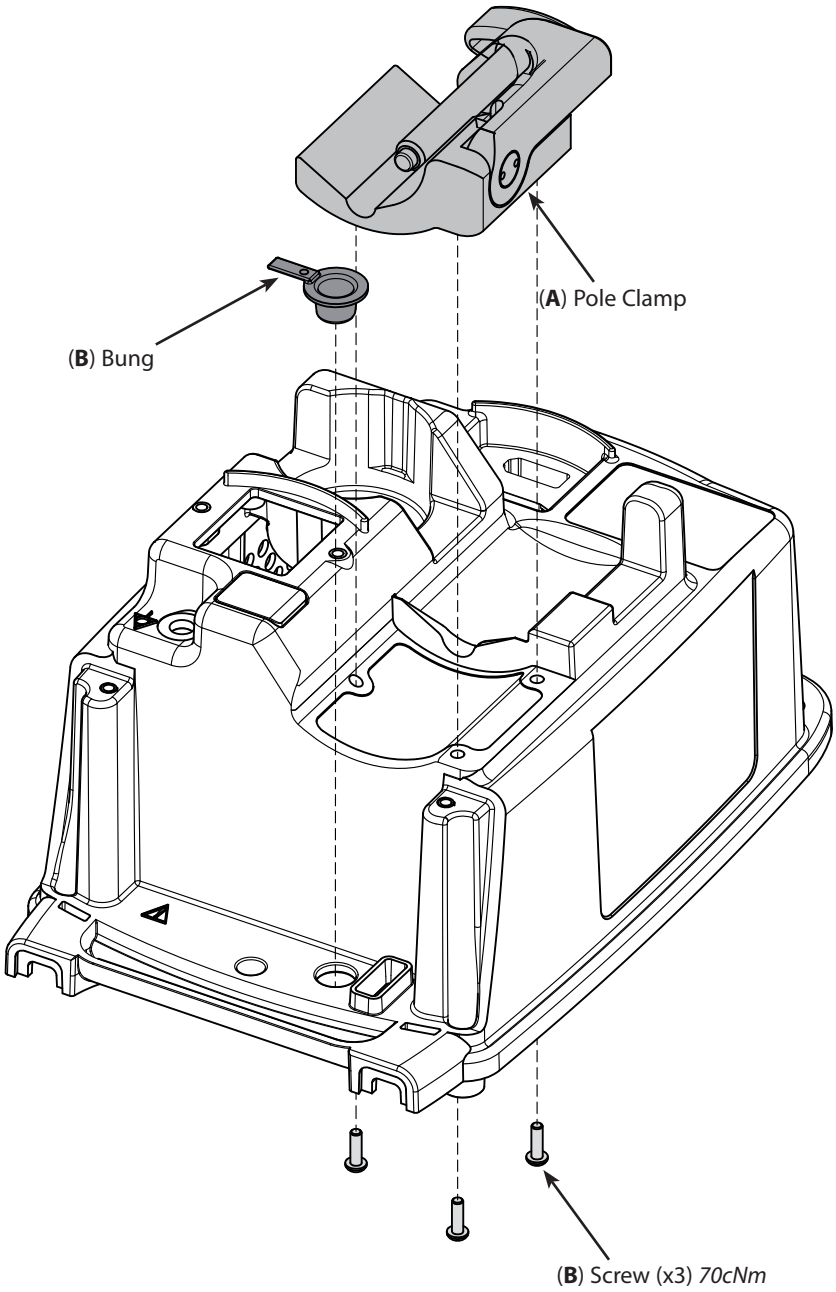
Item	Description	Part Number
A	Alaris GP Mains Inlet Kit	1000SP01251
B	Alaris GP IrDA PCB Flexi Kit	1000SP01308
C	Alaris GP Fastener Spares Kit	1000SP01252
D	Magnet IR Detect	1000ME01303
E	Stud PE Connector M6 Thread X 15	0000ME00141
*	Bussmann Fuse Gmd-1.25A	0000ME00770

Rear Case and Subassemblies (continued)

Pole clamp

Replacement Procedure

1. Remove three pole clamp screws.
2. Reassemble in reverse order.



Spare parts

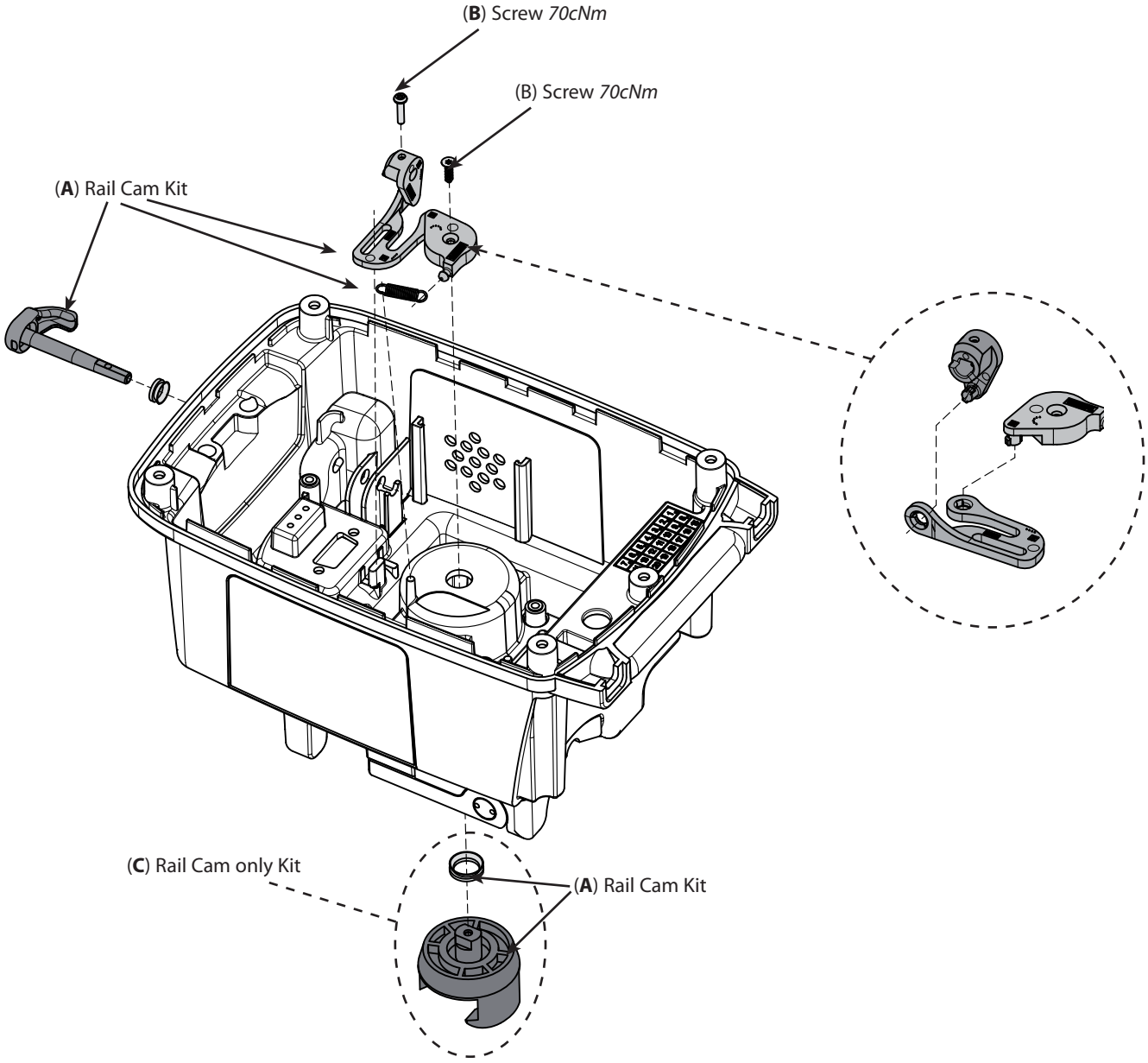
Item	Description	Part Number
A	Asena SP, Assy, Pole Clamp	1000SP00115
B	Alaris GP Fastener Spares Kit	1000SP01252

Rear Case and Subassemblies (continued)

Rail cam

Replacement Procedure

1. Remove screw from lever release.
2. Remove screw from lever rail cam.
3. Remove spring from the lever rail cam.
4. Reassemble in reverse order.



Spare parts

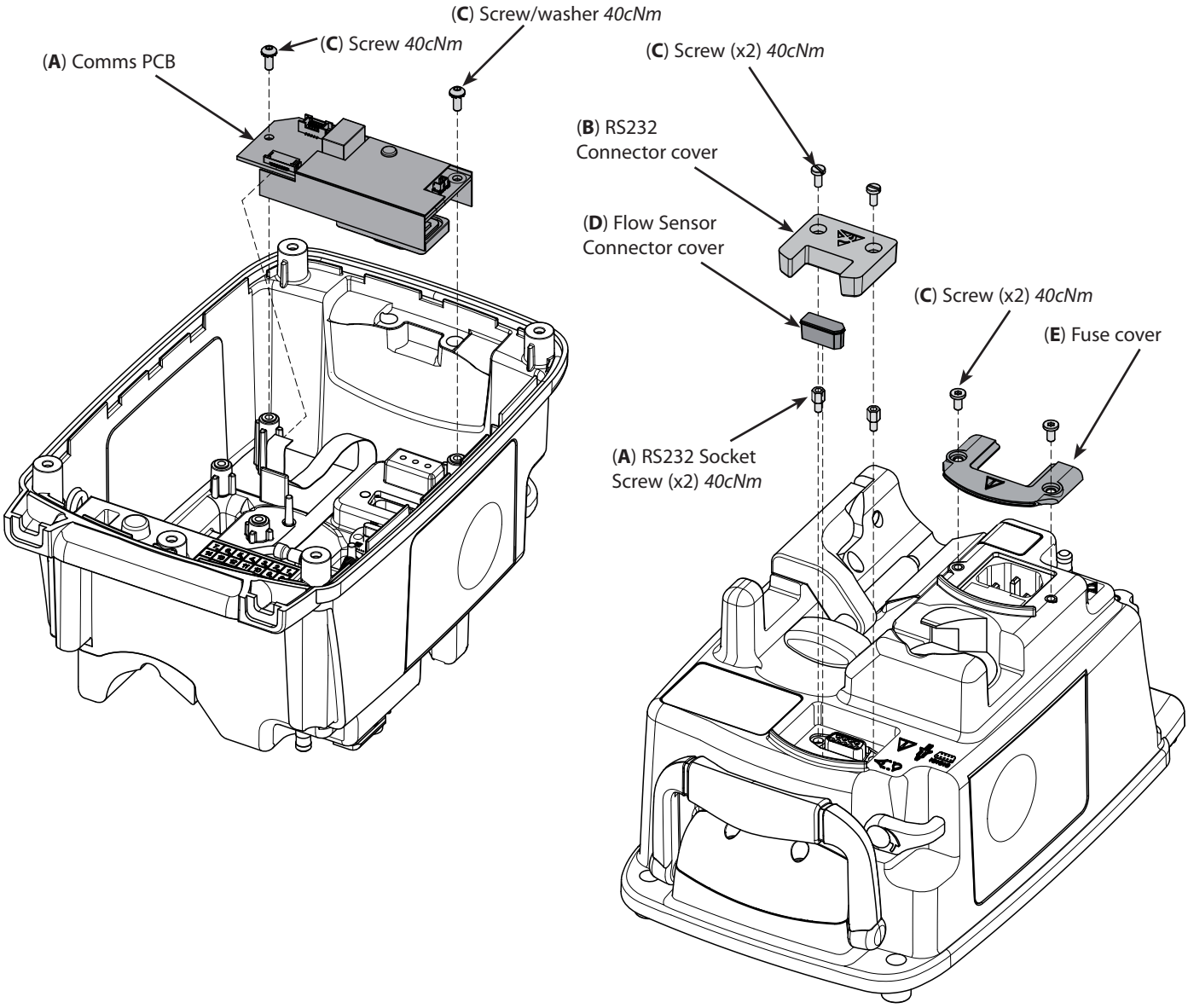
Item	Description	Part Number
A	Alaris GP Docking Station Kit	1000SP01307
B	Alaris GP Fastener Spares Kit	1000SP01252
C	Alaris SP Cam Rail Clamp Only Kit	1000SP01323

Rear Case and Subassemblies (continued)

RS232 Connector & Comms PCB

Replacement Procedure

1. Remove two retaining screws and washers from assembly.
2. Remove RS232 connector cover and two RS232 socket screws.
3. Remove RS232 Connector & Comms PCB assembly.
4. Reassemble in reverse order.



Spare parts

Item	Description	Part Number
A	Alaris GP Comms PCB Kit	1000SP01256
B	Cover RS232	1000ME01745
C	Alaris GP Fastener Spares Kit	1000SP01252
D	Asena GW, Assy, Cover Dust Drop Sensor	1000ME00291
E	Fuse Cover	1000ME00655

Rear Case and Subassemblies (continued)

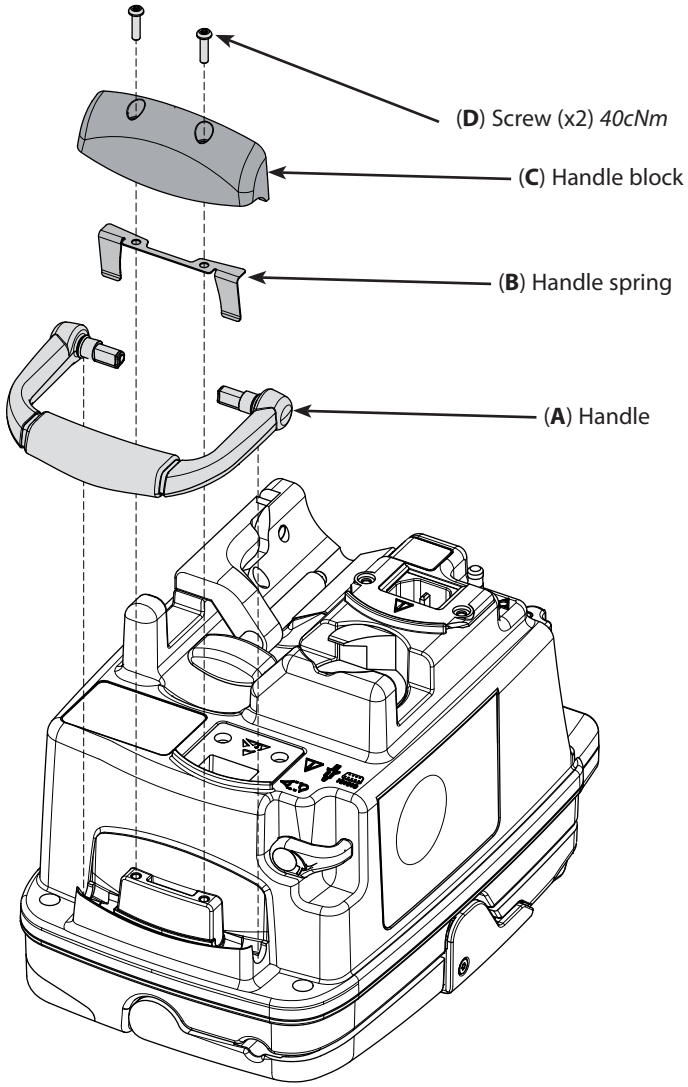
Handle

Replacement Procedure

1. Remove two screw from handle block.
2. Remove handle block, handle spring and handle.
3. Reassemble in reverse order.

Refitting notes:

1) Make sure that the handle spring is in front of the handle and not behind it.



Spare parts

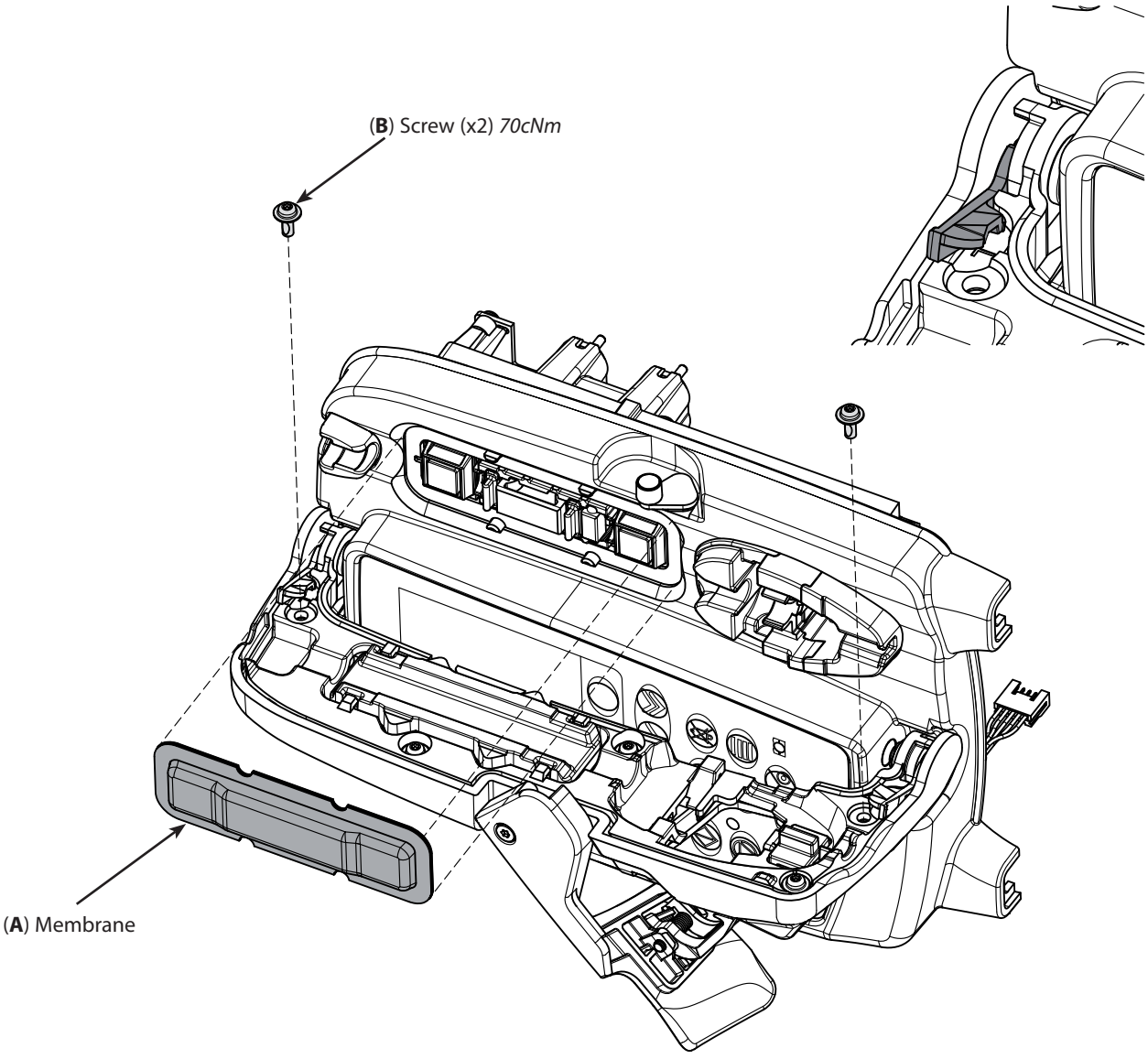
Item	Description	Part Number
A	Asena LVP Overmould Handle	1000ME01845
B	Handle Spring Asena LVP	1000ME00630
C	Asena LVP Handle Retaining Block	1000ME00632
D	Alaris GP Fastener Spares Kit	1000SP01252

Front Case and Subassemblies

Door

Replacement Procedure

1. Remove the two screws securing the hinge locks.
2. Open the two hinge locks.
3. Remove the door.
4. Unscrew the two hinge pins.
5. Reassemble in reverse order.

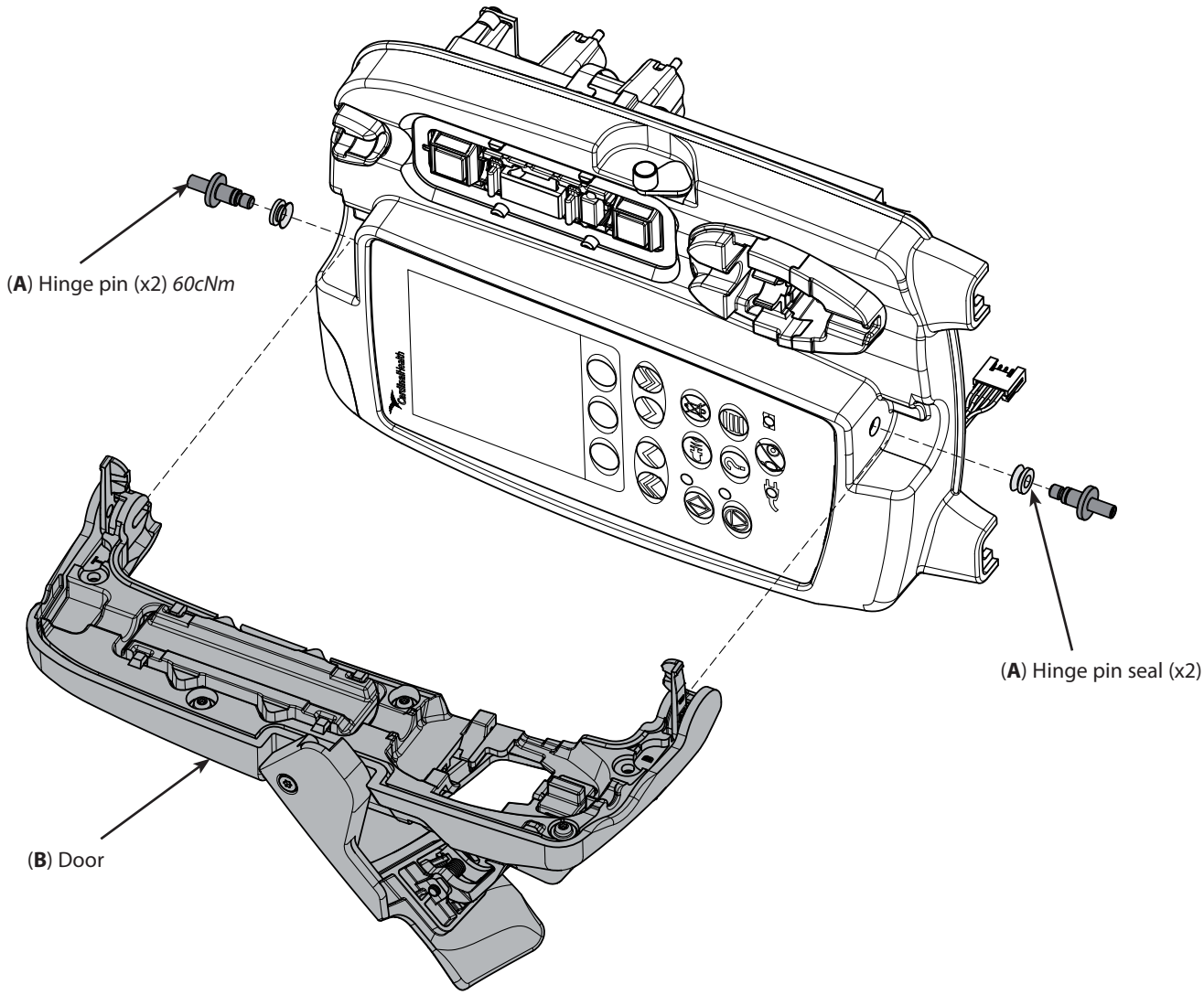


Spare parts

Item	Description	Part Number
A	Asena LVP Assembly Membrane	1000ME00667
B	Alaris GP Fastener Spares Kit	1000SP01252

Front Case and Subassemblies (continued)

Door continued



Spare parts

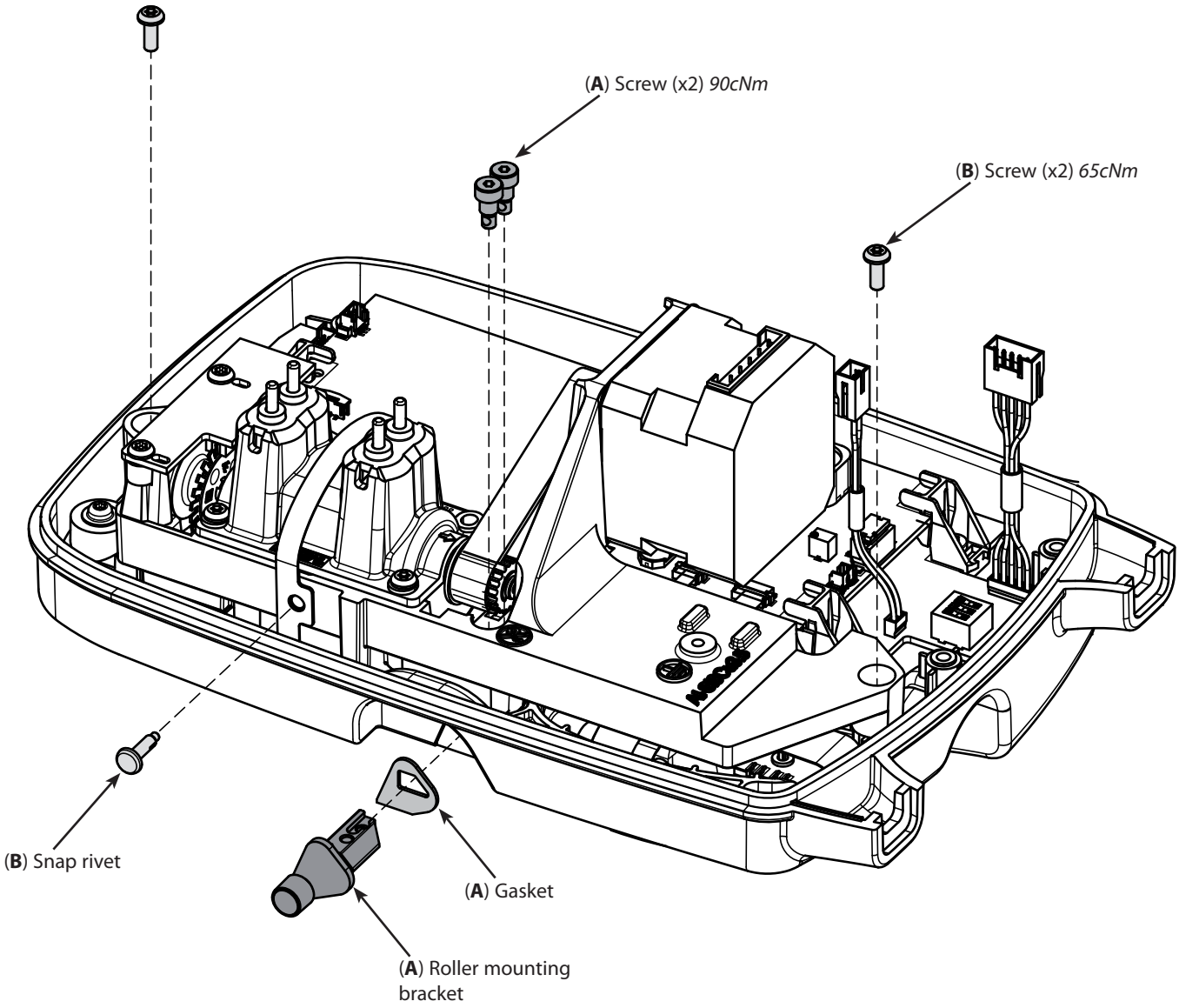
Item	Description	Part Number
A	Alaris GP Hinge Pin Kit	1000SP01246
B	Alaris GP Door Kit	1000SP01244

Front Case and Subassemblies (continued)

Chassis assembly

Replacement Procedure

1. Disconnect four cables from the Interface PCB and one cable from the Control PCB.
2. Remove the two screws securing the roller mounting.
3. Remove the roller mounting and gasket.
4. Remove the snap rivet securing the door detector flexible circuit.
5. Remove the two screws securing the chassis.
6. Carefully withdraw the chassis.
7. Reassemble in reverse order.



Spare parts

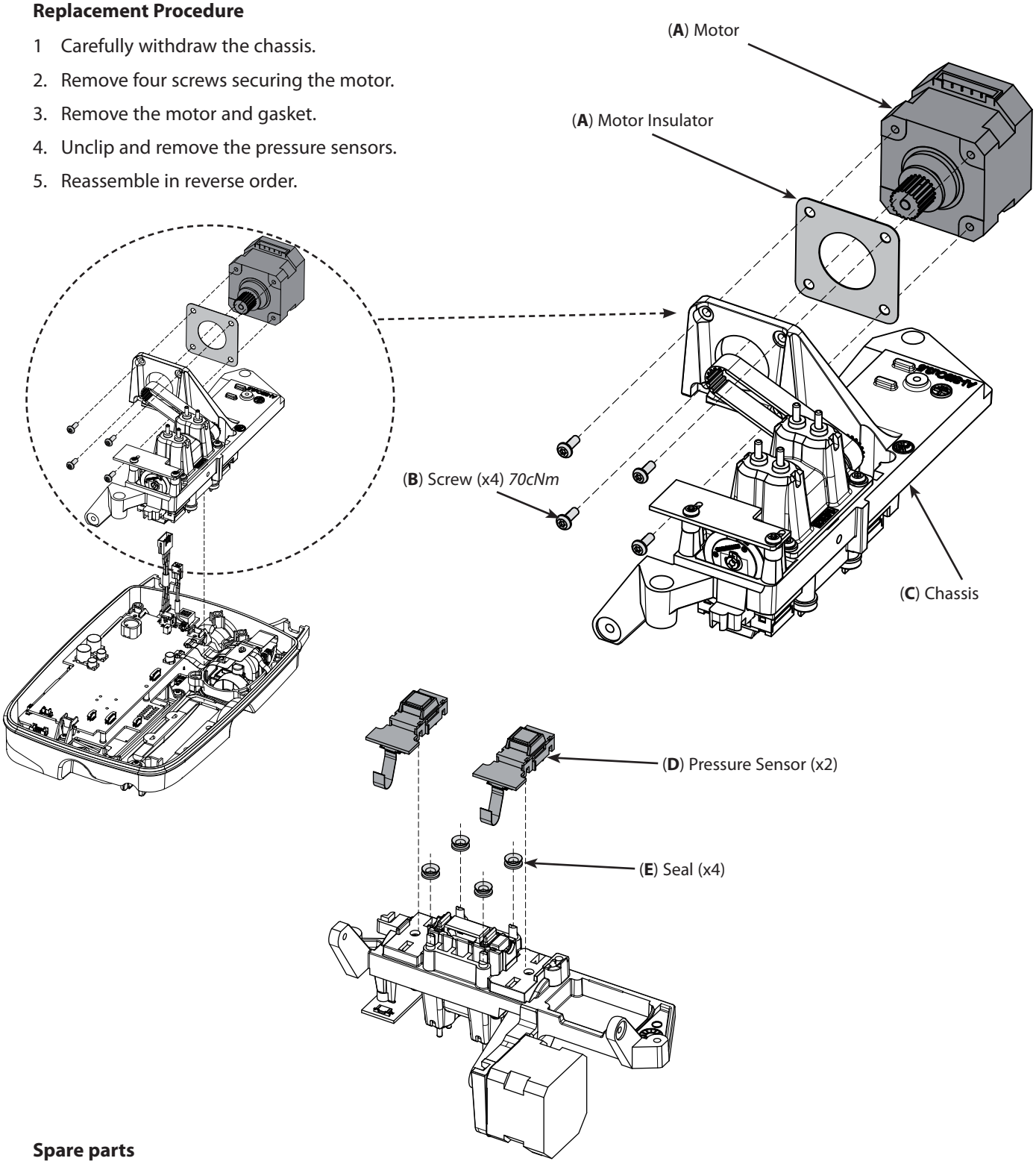
Item	Description	Part Number
A	Alaris GP Roller Mounting Bracket Kit	1000SP01303
B	Alaris GP Fastener Spares Kit	1000SP01252

Front Case and Subassemblies (continued)

Chassis assembly breakdown

Replacement Procedure

1 Carefully withdraw the chassis.
2. Remove four screws securing the motor.
3. Remove the motor and gasket.
4. Unclip and remove the pressure sensors.
5. Reassemble in reverse order.



Spare parts

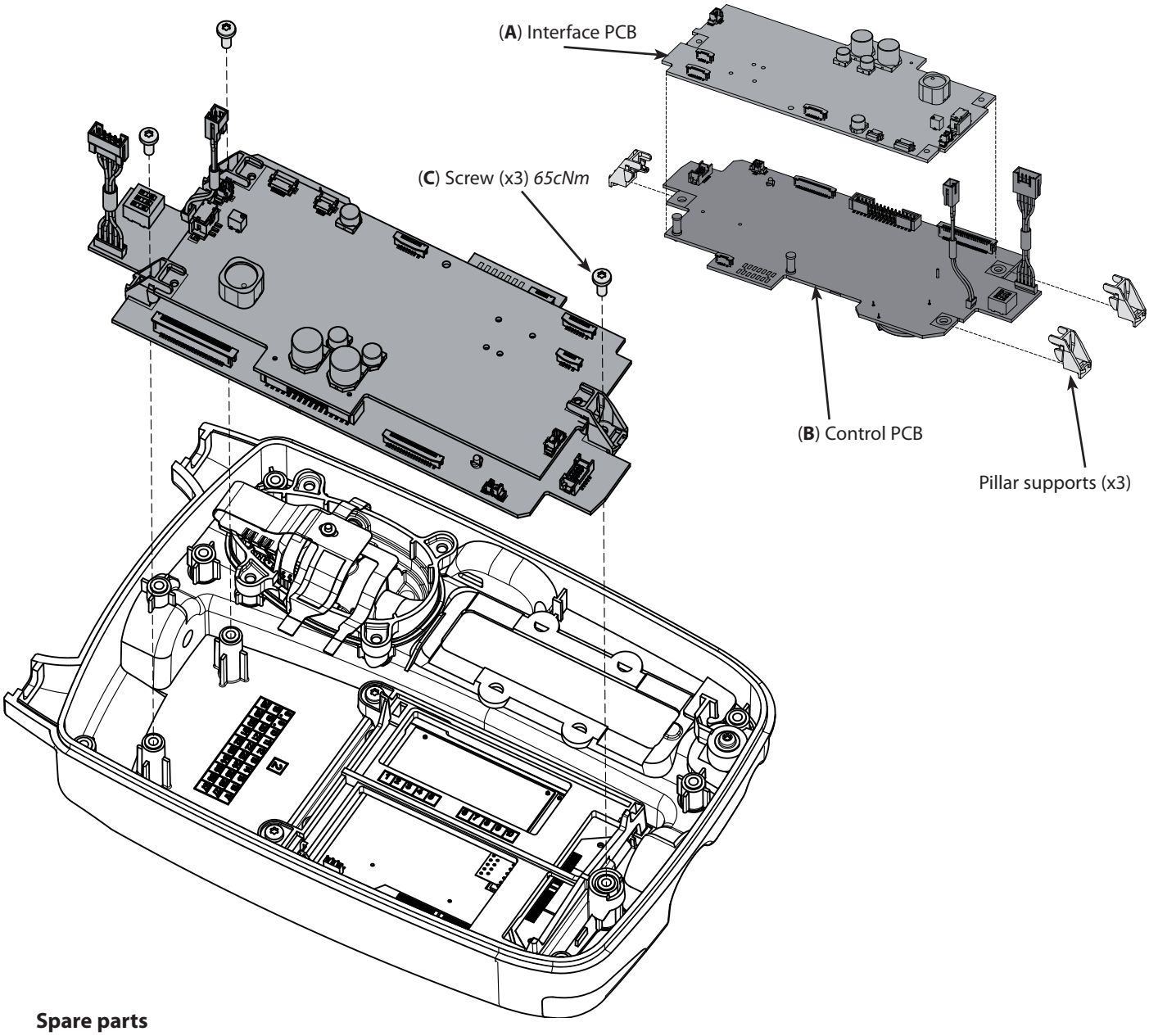
Item	Description	Part Number
A	Alaris GP Motor Kit	1000SP01296
B	Alaris GP Fastener Spares Kit	1000SP01252
C	Alaris GP Pumping Mech (Minus Motor) Kit	1000SP01247
D	Alaris GP Pressure Sensor Kit	1000SP01254
E	V Seals Hinge Pins V5a-NBR	0000ME00767

Front Case and Subassemblies (continued)

Control PCB and Interface PCB

Replacement Procedure

1. Disconnect display and keypad cables from Control PCB.
2. Remove the three retaining screws and washers.
3. Remove the three pillar supports.
4. When fitting Control PCB ensure all flexi and cables are routed clear of PCB.
5. Reassemble in reverse order.



Spare parts

Item	Description	Part Number
A	Alaris GP Interface PCB Kit	1000SP01300
B	Alaris GP Control PCB Kit	1000SP01298
C	Alaris GP Fastener Spares Kit	1000SP01252

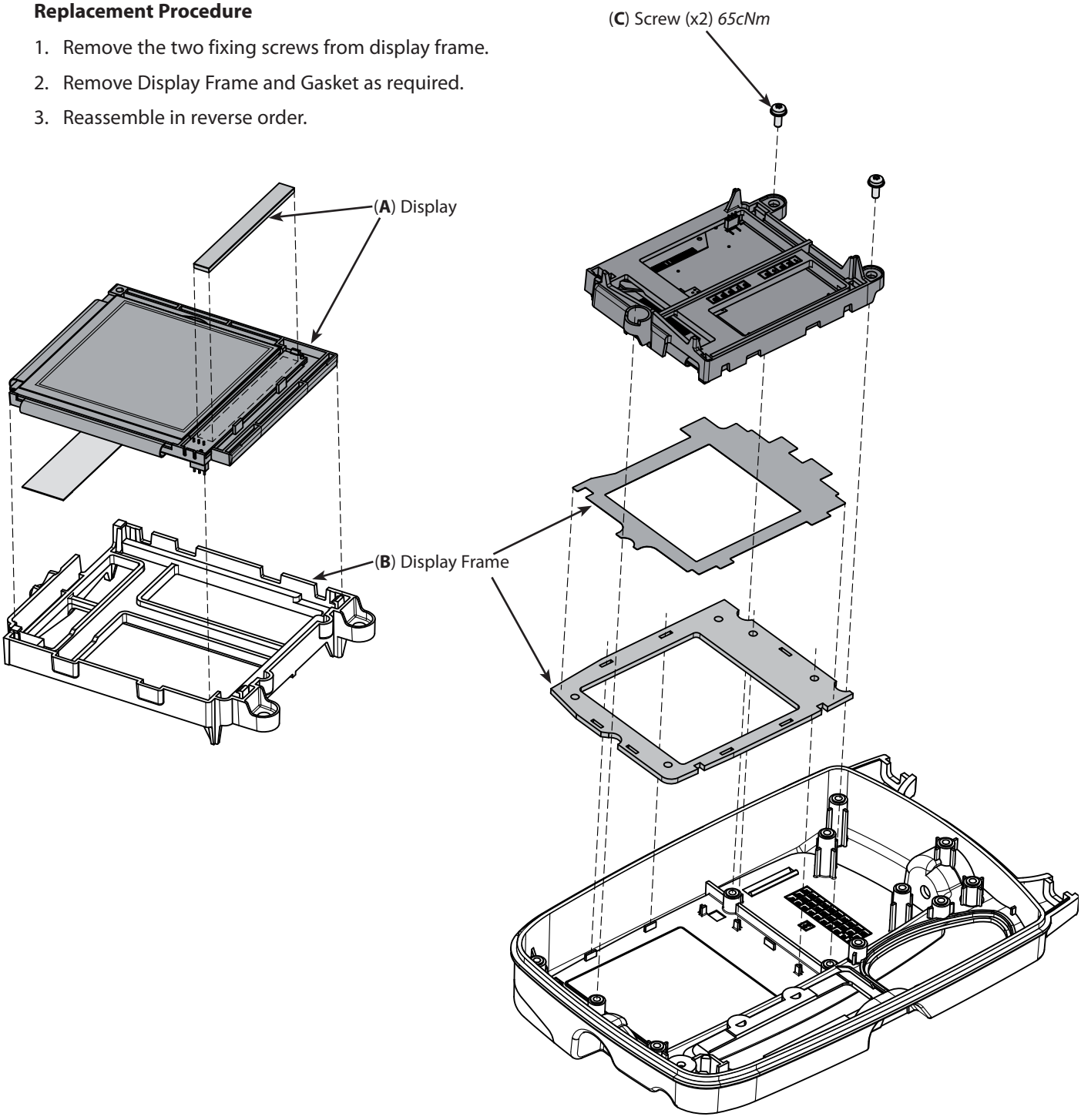
Note: Three Pillar Supports are supplied with both PCB kits.

Front Case and Subassemblies (continued)

Display PCB

Replacement Procedure

1. Remove the two fixing screws from display frame.
2. Remove Display Frame and Gasket as required.
3. Reassemble in reverse order.



Spare parts

Item	Description	Part Number
A	Alaris GP Display Kit	1000SP01255
B	Alaris GP Display Accessories Kit	1000SP01297
C	Alaris GP Fastener Spares Kit	1000SP01252

Front Case and Subassemblies (continued)

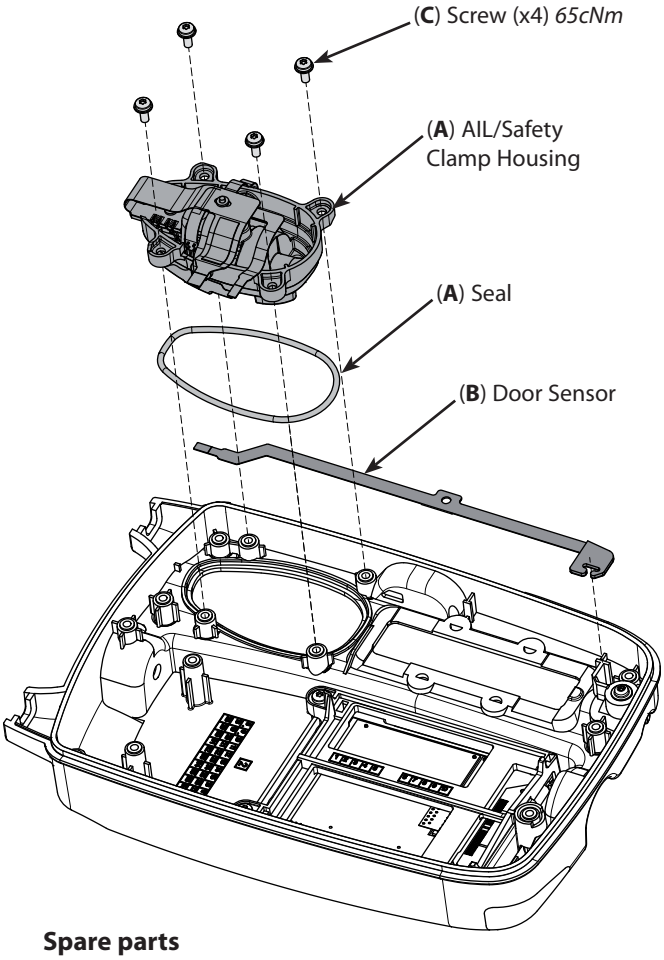
AIL/Safety Clamp Housing, Top Retainer & Door Sensor Flexible Circuit

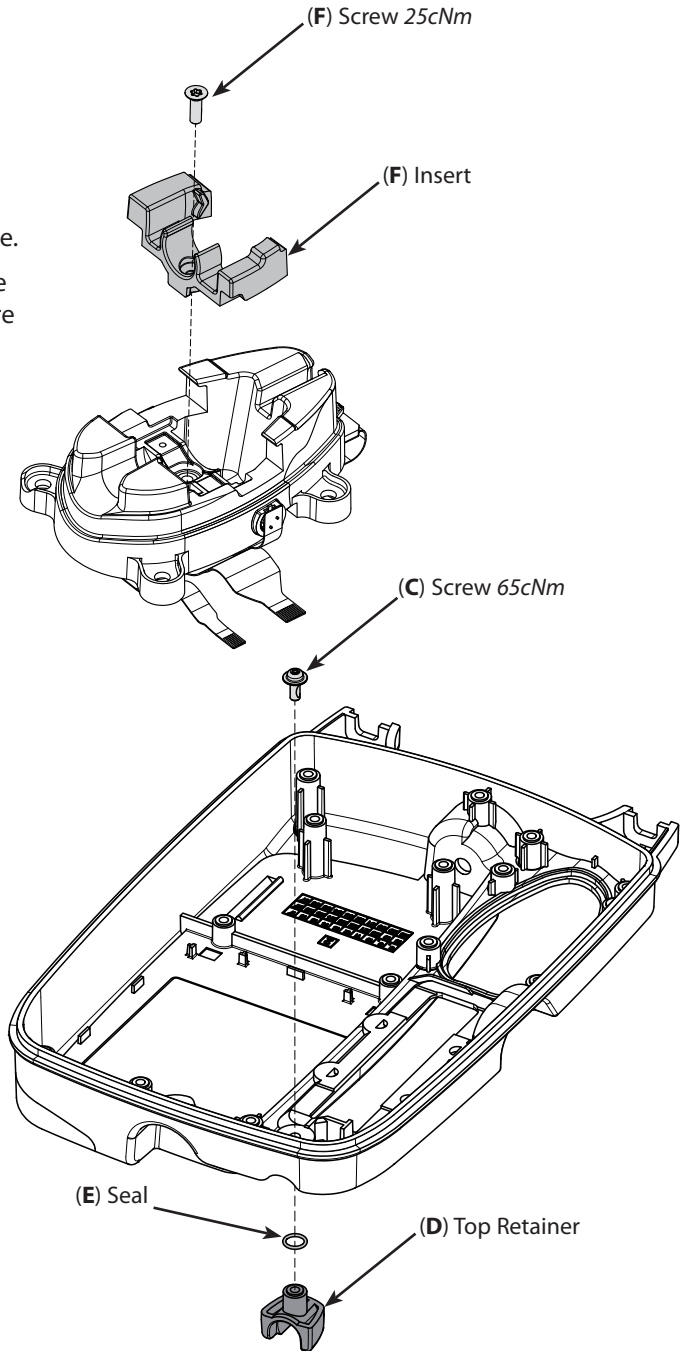
Replacement Procedure

1. Remove the four fixing screws from AIL/Safety Clamp Housing.
2. Remove AIL/Safety Clamp Housing and remove seal as required.
3. Remove one screw securing coloured insert as required.
4. Remove one screw from Top Retainer.
5. Remove Top Retainer and remove O ring as required.
6. Remove Door Sensor Flexible Circuit as required.
7. Reassemble in reverse order.

Refitting notes:

1) Door Sensor Flexible Circuit is retained using hot melt glue.
2) The Screw (F) for the insert torque is 25cNm instead of the original 10cNm due to the new insert plastic which is more tolerant and will not crack. Any cracked Inserts should be replaced by the kit part number 1000SP01417.





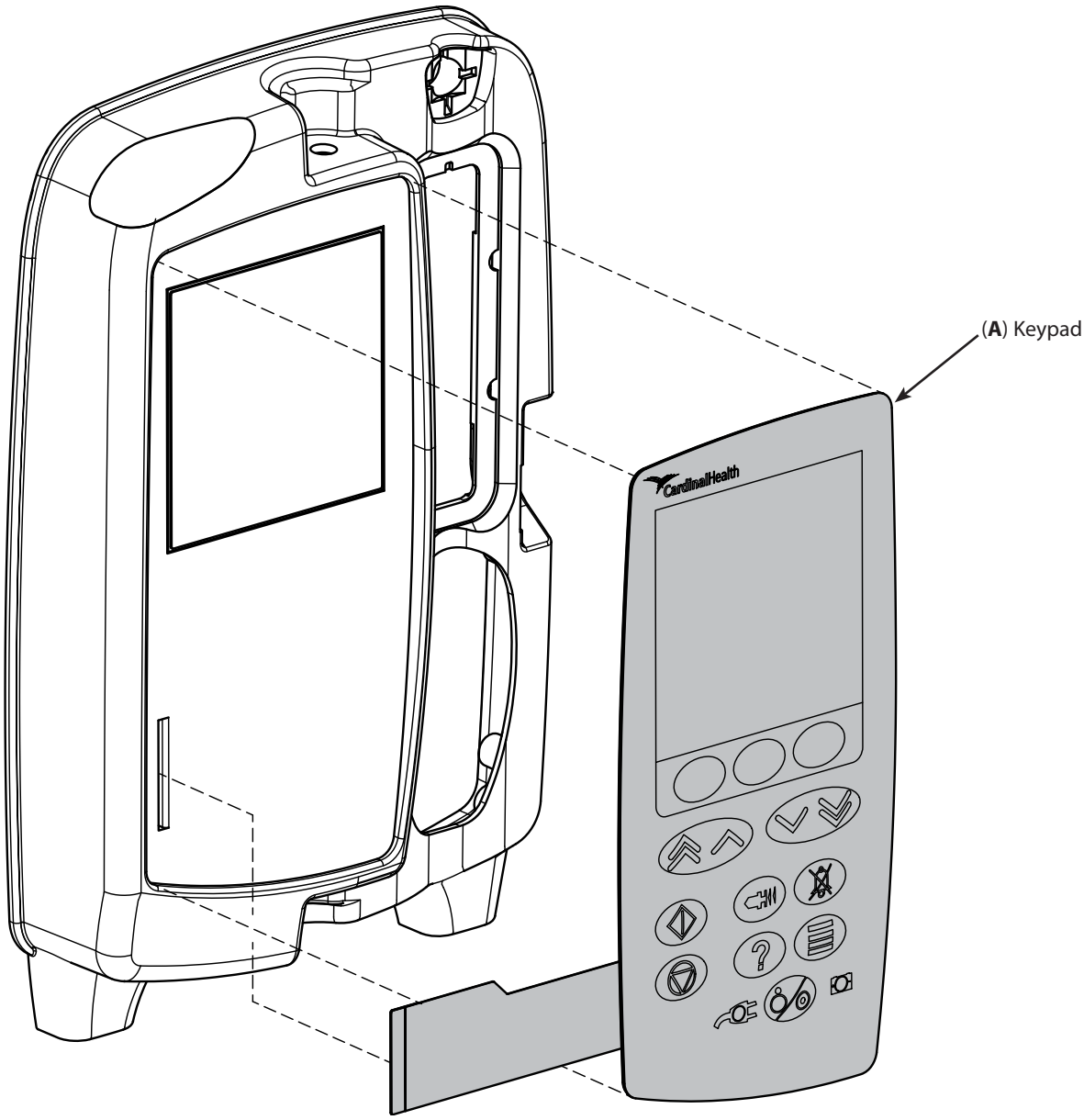
Spare parts

Item	Description	Part Number
A	Alaris GP AIL/Safety Clamp Housing Kit	1000SP01249
B	Door Detect Flexible Circuit	1000EL00643
C	Alaris GP Fastener Spares Kit	1000SP01252
D	Asena LVP GP Top Retainer	1000ME00701
E	Seal O Ring 6ID 1CSDIA Silicon	0000ME00691
F	Spares Kit (Orange Clip & Screw)	1000SP01417

Keypads and Labels

Replacement Procedure

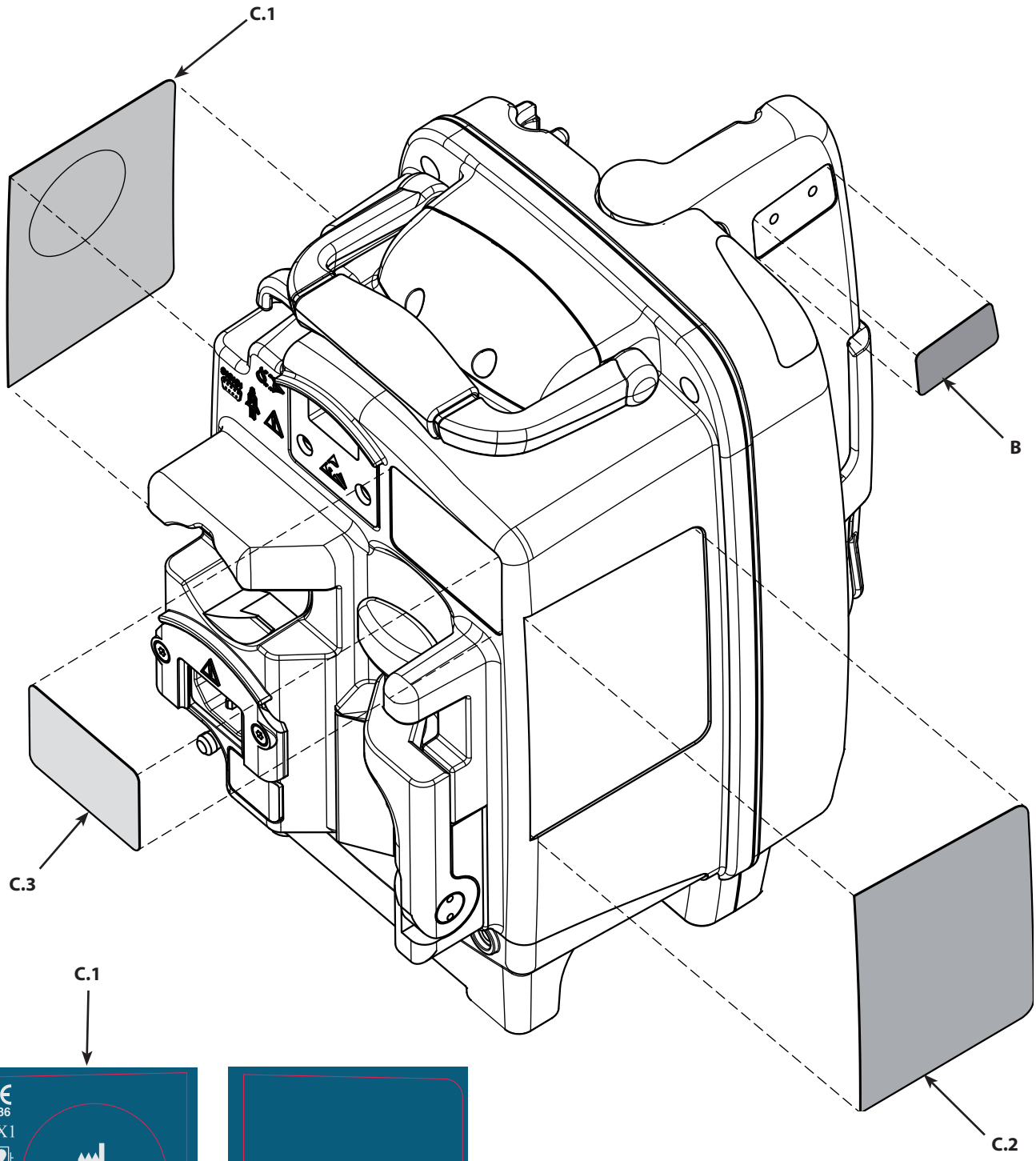
1. Discard keypad when removed as it cannot be reused.
2. Fit replacement keypad after removing backing paper from underside. Handle replacement keypad carefully to avoid damage.
3. Remove label(s) from case as required.
4. Clean case where replacement label(s) are to be fitted.
5. Fit replacement label(s) taken from label sheet as required.
6. Ensure keypad membrane flexi tail is routed correctly.

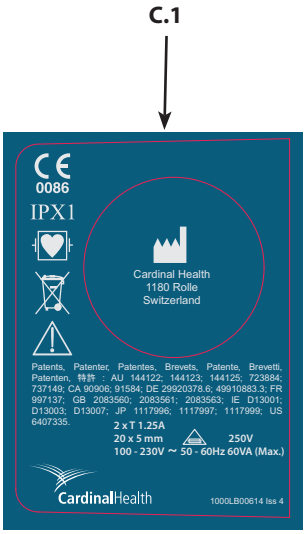


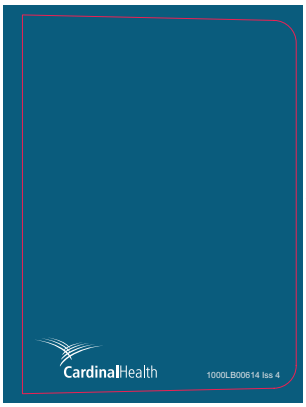
Spare parts

Item	Description	Part Number
A	Alaris GP Keypad BOM	1000LB00623
B	Alaris GP Door Label Set	1000LB01040
B	Alaris GP Guardrails Door Label	1000LB01475
C	Alaris GP Label Set BOM	1000LB00614

Keypads and Labels (continued)







Serial Information box

Appendix A

Electromagnetic Compatibility

Electromagnetic Compatibility

Warning:

- The use of any accessory, transducer, or cable with the Pump other than those specified may result in increased emissions or decreased immunity of the pump.
- The Pump should not be used adjacent to or stacked with other equipment, however if adjacent or stacked use is necessary, the Pump should be observed to verify normal operation in the configuration in which it will be used.

Caution:

- The Pump is a CISPR 11 Group 1 Class B Medical Equipment System and intended for use by healthcare professionals only.
- Medical Electrical Equipment needs special precautions regarding EMC and needs to be installed, put into service and used according to the EMC information provided in the accompanying documents.
- Portable and Mobile RF communications can affect Medical Electrical Equipment.
- Operating the Pump near equipment which radiates high energy radio frequencies (electro surgical or cauterizing equipment, portable radios, cellular telephones, etc.) may cause false alarm conditions. If this happens, reposition the Pump away from the source of interference or turn off the Pump and manually regulate the flow.

Guidance and Manufacturer's Declaration – Electromagnetic Emissions		
The Pump is intended for use in the electromagnetic environment specified below. The customer or the user of the Pump should assure that it is used in such an environment.		
Emissions Test	**Compliance**	**Electromagnetic Environment – Guidance**
CISPR 11 RF Emissions	Group 1	The pump uses RF energy only for its internal function in the normal product offering. Therefore, its RF emissions are very low and are not likely to cause any interface in nearby electronic equipment.
CISPR 11 RF Emissions	Class B	The pump is suitable for use in all establishments, including domestic, and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
EN 61000-3-2 Harmonic Emissions	Class A	
EN 61000-3-3 Voltage Fluctuations, Flicker Emissions	Complies	

Electromagnetic Compatibility *(continued)*

Guidance and Manufacturer's Declaration - Electromagnetic Immunity		
The Pump is intended for use in the electromagnetic environment specified below. The customer or the user of Pump should assure that it is used in such an environment.		
Immunity Test	**Compliance Level EN 60601-2-24 EN 60601-1-2**	**Electromagnetic Environment – Guidance**
EN 61000-4-2 Electro-Static Discharge (ESD)	±8 kV contact (Note 2) ±15 kV air (Note 2)	Floors should be wood, concrete, or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30 %.
EN 61000-4-4 Electrical Fast Transient, Burst (EFT) (Note 3)	±2 kV for power supply lines N/A (Note 4)	Mains power quality should be that of a typical commercial or hospital environment.
EN 61000-4-5 Power Line Surge (Note 3)	±1 kV Line(s) to Line(s) ±2 kV Line(s) to Earth	Mains power quality should be that of a typical commercial or hospital environment.
EN 61000-4-8 Power Frequency Magnetic Field (50/60 Hz)	400 A/m 50 Hz (Note 2)	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
EN 61000-4-11 Voltage Dips, Short Interruptions, and Voltage Variations (Note 3)	<5 % *U*T (>95 % dip in *U*T) for 0.5 cycle	Mains power quality should be that of a typical commercial or hospital environment. If the user of the pump requires continued operation during power mains interruptions, it is recommended that the pump be powered from an uninterruptible power supply or a battery. The pump does employ an internal short duration battery.
	40 % *U*T (60 % dip in *U*T) for 5 cycles	
	70 % *U*T (30 % dip in *U*T) for 25 cycles	
	<5 % *U*T (>95 % dip in *U*T) for 5 sec	

Note 1—U_T is the AC mains voltage prior to application of the test level.
Note 2—Compliance levels raised by EN 60601-2-24.
Note 3—Performed at the Minimum and Maximum Rated Input Voltage.
Note 4—Cardinal Health recommends using signal cables of less than 3 meters in length and this requirement is applicable only if signal cables are 3 meters or more in length. (EN 60601-1-2:2002, Clause 36.202.4)

Electromagnetic Compatibility *(continued)*

Guidance and Manufacturer's Declaration—Electromagnetic Immunity
LIFE SUPPORT Equipment

The Pump is intended for use in the electromagnetic environment specified below.
The customer or the user of the Pump should ensure that it is used in such an environment.

Immunity Test	Compliance Level EN 60601-2-24 EN 60601-1-2	Electromagnetic Environment – Guidance
EN 61000-4-6 Conducted RF	10 V rms (Note 3)	Portable and mobile RF communications equipment should be used no closer to any part of the pump, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. **Recommended Separation Distance** $d = \left[\frac{3.5}{V_1}\right]\sqrt{P}$ $d = \left[\frac{12}{V_2}\right]\sqrt{P}$ 80 MHz to 800 MHz $d = \left[\frac{12}{E_1}\right]\sqrt{P}$ 80 MHz to 2.5 GHz $d = \left[\frac{23}{E_1}\right]\sqrt{P}$ 800 MHz to 2.5 GHz where *P* is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and *d* is the recommended separation distance in meters (m).[a] Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,[b] should be less than the compliance level in each frequency range.[c] Interference may occur in the vicinity of equipment marked with the following symbol:
EN 61000-4-3 Radiated RF	10 V/m (Note 3)	

Note 1—At 80 MHz and 800 MHz, the higher frequency range applies.
Note 2—These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.
Note 3—Compliance levels raised by EN 60601-2-24.

[a] The compliance levels in the ISM frequency bands between 150 kHz and 80 MHz and in the frequency range 80 MHz to 2.5 GHz are intended to decrease the likelihood that mobile/portable communications equipment could cause interference if it is inadvertently brought into patient areas. For this reason, an additional factor of 10/3 is used in calculating the recommended separation distance for transmitters in these frequency ranges.
[b] Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast, and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the pump is used exceeds the applicable RF compliance level above, the pump should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the pump.
[c] Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 10 V/m.

Electromagnetic Compatibility *(continued)*

Recommended Separation Distances for LIFE SUPPORT Equipment between portable and mobile RF communications equipment and the Pump

The Pump is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled.
The user of the Pump can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the Pump as recommended below, according to the maximum output power of the communications equipment.

Rated Maximum Output Power of Transmitter W	**Separation Distance According to Frequency of Transmitter** m			
	150 kHz to 80 MHz Outside ISM bands 3.5 $d = [\text{------}]\sqrt{P}$ V_1	**150 kHz to 80 MHz In ISM bands** 12 $d = [\text{------}]\sqrt{P}$ V_2	**80 MHz to 800 MHz** 12 $d = [\text{------}]\sqrt{P}$ E_1	**800 MHz to 2.5 GHz** 23 $d = [\text{------}]\sqrt{P}$ E_1
0.01	0.03	0.12	0.12	0.23
0.1	0.11	0.38	0.38	0.73
1	0.35	1.20	1.20	2.30
10	1.11	3.80	3.80	7.28
100	3.50	12.00	12.00	23.00

For transmitters rated at a maximum output power not listed above, the recommended separation distance *d* in meters (m) can be determined using the equation applicable to the frequency of the transmitter, where *P* is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

Note 1—At 80 MHz and 800 MHz, the separation distance for the higher frequency range apply.
Note 2—The ISM (Industrial, Scientific, and Medical) bands between 150 kHz and 80 MHz are 6.765 MHz to 6.795 MHz; 13.553 MHz to 13.567 MHz; 26.957 MHz to 27.283 MHz; and 40.66 MHz to 40.70 MHz.
Note 3—An additional factor of 10/3 is used in calculating the recommended separation distance for transmitters in the ISM frequency bands between 150 kHz and 80 MHz and in the frequency range 80 MHz to 2.5 GHz to decrease the likelihood that mobile/portable communications equipment could cause interference if it is inadvertently brought into patient areas.
Note 4—These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.

Appendix B

Disposal

Ensure the Pump is disconnected from the AC power supply and switched off before attempting to service.

The Pump contains static-sensitive components and therefore strict ESD precautions should be observed at all times.
Only use Cardinal Health recommended spare parts.
Following all spare part replacement and repair activities, testing must be performed in accordance with the Performance Verification Procedure (PVP), see Chapter 3 'Preventative Maintenance'.

Disposal

Information on Disposal for Users of Waste Electrical & Electronic Equipment

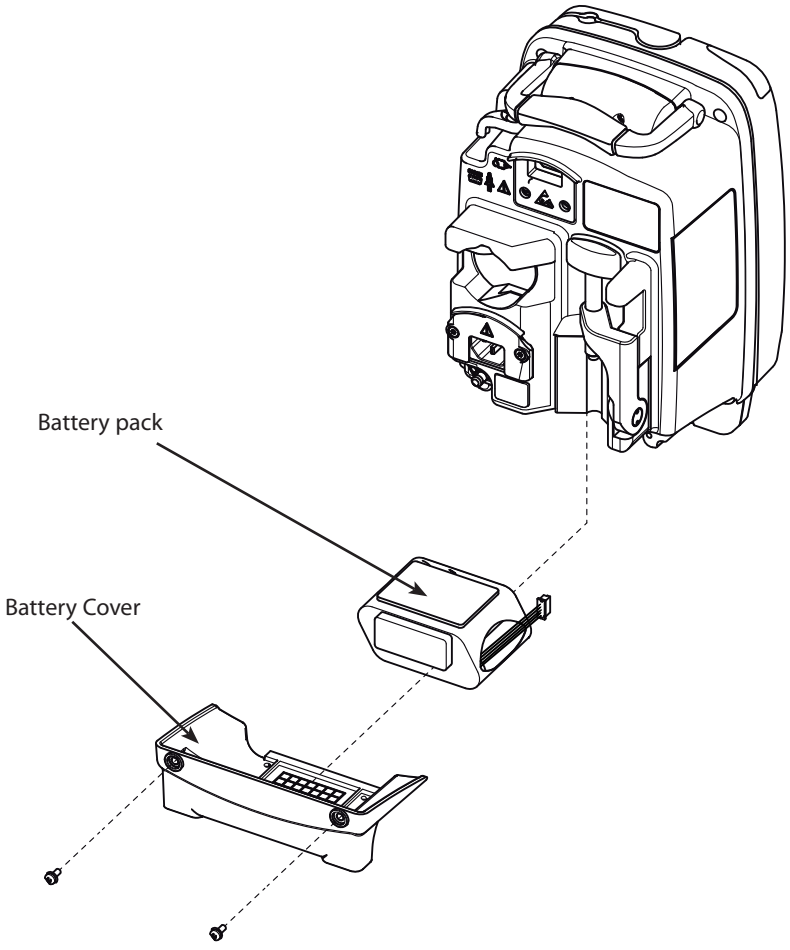
This symbol on the product and/or accompanying documents means that used electrical and electronic products should not be mixed with municipal waste.
If you wish to discard electrical and electronic equipment, please contact your Cardinal Health affiliate office or distributor for further information.
Disposing of this product correctly will help to save valuable resources and prevent any potential negative effects on human health and the environment which could otherwise arise from inappropriate waste handling.

Information on Disposal in Countries outside the European Union
This symbol is only valid in the European Union. The product should be disposed of taking environmental factors into consideration. To ensure no risk or hazard, remove the internal rechargeable battery and the Nickel Metal Hydride battery from the control board and dispose of as outlined by the local country regulations. All other components can be safely disposed of as per local regulations.

Battery Removal

Removal Procedure

Remove the two case screws with integral flat washer in battery cover, remove cover and battery.



Appendix C

Spare Parts Listing

In this chapter

Spare Parts Kits	**76**
Individual Components	**77**
Keypad & Labels	**77**
Software	**77**
Test Equipment	**77**
Kit Bill Of Materials (BOM)	**78**

Spare Parts Kits

Part Number	Description
1000SP01244	Alaris GP Door Kit
1000SP01246	Alaris GP Hinge Pin Kit
1000SP01247	Alaris GP Pumping Mech (Minus Motor) Kit
1000SP01248	Alaris GP Front Case Kit
1000SP01249	Alaris GP AIL/Safety Clamp Housing Kit
1000SP01250	Alaris GP Rear Case Kit
1000SP01251	Alaris GP Mains Inlet Kit
1000SP01252	Alaris GP Fastener Spares Kit
1000SP01253	Alaris GP Battery Compartment Kit
1000SP01254	Alaris GP Pressure Sensor Kit
1000SP01255	Alaris GP Display Kit
1000SP01256	Alaris GP Comms PCB Kit
1000SP01296	Alaris GP Motor Kit
1000SP01297	Alaris GP Display Accessories Kit
1000SP01298	Alaris GP Control PCB Kit
1000SP01299	Alaris GP SD Card Kit
1000SP01300	Alaris GP Interface PCB Kit
1000SP01301	Alaris GP Encoder PCB Kit
1000SP01302	Alaris GP Battery Pack Kit
1000SP01303	Alaris GP Roller Mounting Bracket Kit
1000SP01304	Alaris GP Feet Kit
1000SP01305	Alaris GP PSU PCB Kit
1000SP01306	Alaris GP Speaker Kit
1000SP01307	Alaris GP Docking Station Kit
1000SP01308	Alaris GP IrDA PCB Flexi Kit
1000SP00115	Asena SP, Assy, Pole Clamp
1000SP00487	Asena LVP Battery Pack
1000SP01417	Spares Kit (Orange Clip & Screw)
1000SP01323	Alaris SP Cam Rail Clamp Only Kit

Individual Components

Part Number	Description
0000ME00141	Stud PE Connector M6 Thread X 15
0000ME00768	Cables Ties Hayco 3623793
0000ME00770	Bussmann Fuse Gmd-1.25a
1000EL00605	Drop Sensor Cable
1000EL00606	RS232 Nurse Call Cable
1000EL00607	PSU Cable
1000ME00291	Asena GW, Assy, Cover Dust Drop Sensor
1000ME00630	Handle Spring Asena LVP
1000ME00632	Asena LVP Handle Retaining Block
1000ME01845	Asena LVP Overmould Handle
1000ME00636	Asena LVP Mains Inlet Bracket
1000ME00655	Fuse Cover
1000ME01303	Magnet IR Detect
1000ME01745	Cover RS-232
1000ME00589	Cover Battery Asena LVP
1000ME00590	Foot Battery Cover Asena LVP
1000ME00649	Foot Front Asena LVP
1000ME01611	Seal Case Nickel/graphite
1000ME00667	Asena LVP Assembly Membrane
0000ME00767	V Seals Hinge Pins V5a-nbr
1000EL00643	Door Detect Flexible Circuit
1000ME00701	Asena LVP GP Top Retainer
0000ME00691	Seal O Ring 6id 1csdia silicon
0000ME00423	Pad Self Adhesive Double Sided 12x12mm

Keypad & Labels

Part Number	Description
1000LB00623	Alaris GP Keypad BOM
1000LB01040	Alaris GP Door Label Set
1000LB00614	Alaris GP Label Set BOM
1000LB01475	Alaris GP Guardrails Door Label

Software

Part Number	Description
1000SP01412	Alaris LVP GP F/ware Upgrade V1.7.18 Kit
1000CD00028	Alaris SMU
1000SP01310	Alaris GP Editor Software Kit

Test Equipment

Part Number	Description
60793	GP Series Infusion Set, 2 Y
1000EL00979	Converter Cable -USB To Serial
1000EL00980	Converter Cable -USB To 4x Serial
1000SP01183	Cable RS232 Filtered

Kit Bill Of Materials (BOM)

Kit	Description	Description	Qty
1000SP01244	Alaris GP Door Kit	Alaris GP Door	1
		Assy Screw & Washer M2, 5 X 6 With Patch	2
		Alaris GP Door Label	1
1000SP01246	Alaris GP Hinge Pin Kit	Assembly Insulated Door Hinge	2
		V Seals Hinge Pins V5a-NBR	2
1000SP01247	Alaris GP Pumping Mech (Minus Motor) Kit	Alaris GP Pumping Mech	1
		Rivet Snap 03 6.5/7.5 Panel Thickness	1
		V Seals Hinge Pins V5a-NBR	6
		Screw M3x8 Button Head With Patch	4
1000SP01248	Alaris GP Front Case Kit	Case Front Moulded Asena LVP	1
		Alaris GP Keypad Bom	1
		Asena LVP Assembly Membrane	1
		Seal O Ring 6ID 1CSDIA Silicon	1
		Asena LVP GP Top Retainer	1
		Screw M3 X 8 Pan Washer Head With Patch	1
		Foam Gasket Display Asena LVP	1
		Door Detect Flexible Circuit	1
		Rivet Snap 03 6.5/7.5 Panel Thickness	1
		Foot Front Asena LVP	2
		Seal Case Nickel/graphite	1
		V Seals Hinge Pins V5a-NBR	2
		Adhesive Hot Melt Stick 12mm White	1
1000SP01250	Alaris GP Rear Case Kit	Case Rear Moulded Asena LVP	1
		Seal Case Nickel/Graphite	1
		Alaris GP Label Set BOM	1
		Spacer Speaker Label	1
1000SP01251	Alaris GP Mains Inlet Kit	Mains Inlet Schaffner Fn9260b Inc Cable	1
		Asena LVP Gasket Mains Inlet	1

Kit Bill Of Materials (BOM)

Kit	Description	Description	Qty
1000SP01252	Alaris GP Fastener Spares Kit	Plug Pull M12	10
		Screw M3 X 8 Pan Washer Head With Patch	10
		Screw M3x8 Button Head With Patch	30
		Screw M3x8 Pan Hd T10 Skt & Flat Washer	50
		Screw M3x10 Button Hd T10	20
		Screw M3x8 Button Hd T10 Shkpf Washer	30
		Nut M6 Zp+P	10
		Washer M6 Internal Shakeproof St Z & C	10
		Screw Pt Kc30x10 Csk (T8)-Rogard	10
		Screw Pt K25x12 Pan Hd T8 Hexalobular Sk	10
		Screw M3x12 Pan Hd Torx (T10)	20
		Washer M3 Shakeproof External	10
		Screw Lock RS232 4-40 UNC -4-40 UNC	10
		Screw M3x6 Flat Head Hexalobular Skt-8	10
		Screw, Pan Hd Slotted 4-40 UNC Nylon	10
		Screw M2, 5 X 8 Csk Head, With Patch	10
		Assy Screw & Washer M2, 5 X 6 With Patch	10
		Assembly Screw & Washer, M3x8 With Patch	10
		Screw M3 X 8 Extra Low Head With Patch	10
		Plastic Snap Rivet	10
		Rivet Snap 03 6.5/7.5 Panel Thickness	10
		Alaris GP LVP Fixings Kit Instructions	1
1000SP01253	Alaris GP Battery Compartment Kit	Cover Battery Asena LVP	1
		Foot Battery Cover Asena LVP	2
1000SP01256	Alaris GP Comms PCB Kit	Asena LVP RS232 Nurse Call	1
		Screw Lock RS232 4-40 UNC -4-40 UNC	2
		Gasket,PVC Foam,597/8/9 Fso	1
		Insulator RS232 PCB Asena LVP	1
		Plastic Snap Rivet	1
1000SP01297	Alaris GP Display Accessories Kit	LCD Light Mask	1
		Foam Gasket Display Asena LVP	1
		Asena LVP LCD Retainer	1
1000SP01298	Alaris GP Control PCB Kit	Asena LVP Control Card PCB	1
		Rivet Memory CRD	1
		Spacer PCB Richco PST- 6-01	2
		Asena LVP PCB Clip	3
1000SP01299	Alaris GP SD Card Kit	SD Card	1
		Rivet Memory CRD	1

Kit Bill Of Materials (BOM)

Kit	Description	Description	Qty
1000SP01300	Alaris GP Interface PCB Kit	Asena LVP Interface PCB	1
		Asena LVP PCB Clip	3
1000SP01301	Alaris GP Encoder PCB Kit	Asena GP Motor Encoder PCB	1
		Flexi Encoder To Interface PCB	1
		Nylon Spacer	2
1000SP01303	Alaris GP Roller Mounting Bracket Kit	Assembly Roller Mounting Bracket	1
		Gasket Assembly Roller LVP	1
		Screw M3x4 Cap Head Shoulder With Patch	2
1000SP01304	Alaris GP Feet Kit	Foot Front Asena LVP	10
		Foot Battery Cover Asena LVP	10
1000SP01305	Alaris GP PSU PCB Kit	Assembly PSU Asena LVP	1
		Insulator PSU Asena LVP	1
1000SP01307	Alaris GP Docking Station Kit	Cam Rail Clamp	1
		Seal Ring V 10mm Dia	1
		Linkage MDI	1
		Lever Intermediate MDI Asena LVP	1
		Spring Extension OD 4.76 WD 0.66 L 19.05	1
		Lever Rail Cam Asena LVP	1
		Lever Release Medical Device Interface	1
		Seal Ring V 6mm Dia	1
1000SP01308	Alaris GP IrDA PCB Flexi Kit	IrDA Flexible Circuit	1
		Bracket IrDA GP/VP	1
1000SP01254	Alaris GP Pressure Sensor Kit	Housing Upper Pressure Sensor Asena LVP	1
		Actuator Pressure Sensor Asena LVP	1
		Asena GP Pressure Sensor PCB	1
		Housing Lower Pressure Sensor Asena LVP	1
		Flexi Pressure Board to Interface Board	1
1000SP01417	Spares Kit (Orange Clip & Screw)	Insert Coloured Housing Flowstop AIL	1
		Screw M2, 5 X 8 Csk Head, With Patch	1

Appendix D

Service Contacts

Service Contacts

For service, contact your local Affiliate Office or Distributor.

AE

Cardinal Health,
PO Box 5527,
Dubai, United Arab Emirates.
Tel: (971) 4 28 22 842
Fax: (971) 4 28 22 914
www.cardinalhealth.com/international/distributors/alaris

AU

Cardinal Health,
3/167 Prospect Highway,
PO Box 355
Seven Hills, NSW 2147,
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www.cardinalhealth.com/au
techservice-au@cardinal.com

BE

Cardinal Health,
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1800 Vilvoorde,
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Tel: (32) 2 267 38 99
Fax: (32) 2 267 99 21
www.cardinalhealth.com/be
gmb-ctsi-tech.belux@cardinal.com

CA

Cardinal Health,
235 Shields Court,
Markham,
Ontario L3R 8V2,
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Fax: (1) 905-752-3343
www.cardinalhealth.com/ca

CN

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398 Huai Hai Rd(M.),
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Fax: (56) 8621-6384-4025

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Cardinal Health,
Postboks 29,
2820 Gentofte,
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ZA

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Appendix E

Document History

Document History

Issue	Date	CO No.	Author	Update Description
1	20/01/06	5999	Ian Tyler	Initial release
2	December 06	7111	Ian Tyler	New Tech mode section. Spare Part Replacement Procedures chapter added. Troubleshooting chapter added. New Software features added. Spare Parts Listing appendix added.
3	September 08	8587	Ian Tyler	Introduce Calibration information. Update Preventative Maintenance information. Add information on the Alaris® GP Guardrails® Volumetric Pump. Update Corrective Maintenance information.